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Weed control in field and forage crops 1991

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This publication is intended to be used as a guide only. The information presented here should be applicable to most situations if recommendations are followed carefully. Brand names used are included for convenience. Their use does not imply endorsement by the authors or the department.

While every effort has been made to ensure accuracy, Saskatchewan Agriculture and Food does not accept any responsibility for errors in conversion or otherwise. **Consult product labels for final detailed instructions before using product.**

Note: This publication is updated annually and replaces the 1990 and previous issues.

INTRODUCTION

Weed control methods may be classified as: prevention, sanitation, mechanical, cultural, biological and chemical.

It is important to remember that, in almost all cases, no one type of control method will be sufficient by itself. Successful control of a weed problem requires the integration of a variety of control measures selected from the various control methods. The real challenge in developing successful weed control programs is to select the most appropriate combination of control measures that will provide effective, economic control and will not harm the environment.

PART I - NON-CHEMICAL WEED CONTROL

1. PREVENTION

The objective of prevention as a weed control technique is to avoid weed problems by preventing the introduction of weeds into an area. The area in question can be as small as a single field or as large as an entire province or country, depending on the approach taken. Various methods of weed prevention will be discussed below.

Clean seed

The importance of clean seed cannot be over emphasized in preventing the spread of weeds. When non-pedigreed grain is used as seed, it is important to have it properly cleaned. The reduction in the spread of weed seeds is the primary concern but there is also a very substantial benefit to be gained from screening out the smaller grain seeds. Large seeds produce more vigorous seedlings which are better able to compete with weeds.

Seed surveys conducted in Saskatchewan indicate that much of the "seed" planted each year does not meet the minimum standards for seed as outlined in the Canada Seeds Act. Survey results also give an idea of how effective various types of seed cleaning methods are (Table 2). Results of the survey conducted in 1986 are summarized in Tables 1 and 2.

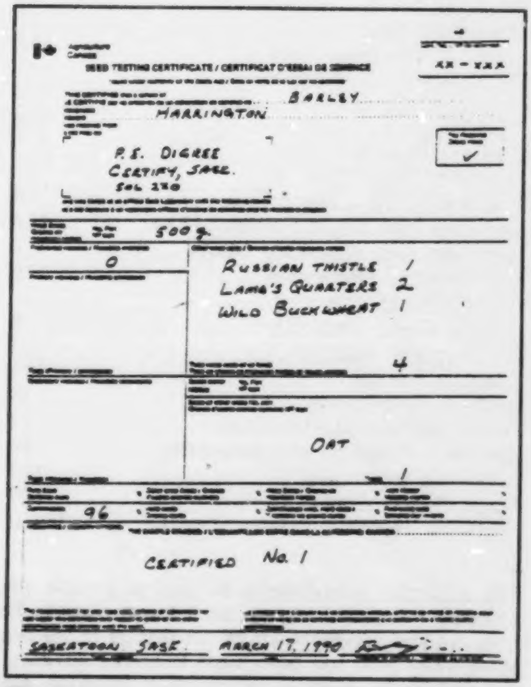
Table 1. Quality of seed used in Saskatchewan, 1986.

Seed Class	% of samples grading: No.1	No.2	Rejected
Foundation	100	0	0
Registered	88	12	0
Certified	92	8	0
Non-pedigreed	57	23	20

Source: Saskatchewan Agriculture and Food

Results of the survey showed that none of the pedigreed seed samples graded rejected and a very high proportion met or exceeded the standards for the highest grade. However, 20% of the non-pedigreed samples did not meet the standards for even the lowest grade of non-pedigreed seed, Common no. 2. Most of the non-pedigreed samples were rejected or down graded due to contamination with weed seeds and seed of other crop kinds.

When purchasing pedigreed seed the Official Seed Sealing Tag is an important document. It indicates the Variety, Kind, Grade and Class of Seed (as designated by the Canada Seeds Act), Crop Certificate Number and Seed Sealing lot number. Purchasers should keep all tags for future reference. Pedigreed seed may contain weed seeds. The actual weed seed content is specified in the Seed Testing Certificate. The purchaser has the right to know what weed seeds or seeds of other crops are present in the pedigreed seed being purchased. An example of a Seed Testing Certificate is given in Figure 1.



SEED TESTING CERTIFICATE / CERTIFICAT D'ESSAI DE SEMENCE

XX - XXX

BARLEY

HARRINGTON

P.S. DIGREE
CERTIFY, SASK.
S0L 2X0

✓

500 g.

0

RUSSIAN THISTLE 1
LAMB'S QUARTERS 2
WILD BUCKWHEAT 1

4

OAT

1

96

CERTIFIED No. 1

SASKATOON SASK. MARCH 17, 1990

Figure 1

Not all seed cleaning facilities do a good of removing weed seeds from grain samples. A survey showed that when some form of specialized seed cleaning equipment was used, over 90% of the samples met the purity standards as set out in the Seeds Act.

Table 2. Effectiveness of various seed cleaning methods used in Saskatchewan in 1986.

	% of samples grading:		
Cleaning Method	No.1	No.2	Rejected
Local Elevator	43	29	28
Mobile Plant	77	14	9
Farm Plant	68	24	8
Commercial Plant	86	8	6
Not Cleaned	0	0	100
Overall	61	21	18

Source: Saskatchewan Agriculture and Food

Commercial cleaning plants do a better job, on average, than farm plants or mobile plants. The worst place to get seed cleaned is at the local elevator. Grain elevators are equipped to remove dockage but they are not well equipped to clean grain up to seed standards. One other serious problem with elevator cleaning is that, while it may remove some weed seeds from the grain, it may add new weed species to the grain to be used for seed because elevator legs cannot be completely cleaned out between batches.

Transport

Proper care in the transport of crop products and equipment can prevent the spread of weeds from one area to another. This is becoming increasingly important as farm operations become larger and more scattered and grain and forages are hauled longer distances to market. It is important to tarp trucks loaded with grain or screenings even for short distances. Care should also be taken when transporting hay or straw as weed seeds can be spread along the way. Tillage equipment is very efficient at spreading root and rhizome segments throughout fields and from one field to another. Patches of perennial weeds should be worked separately from the rest of the field and tillage equipment should be cleaned before it is moved from one patch or field to the next. The same goes for harvesting equipment as it can become heavily contaminated with weed seeds and should be thoroughly cleaned before moving to the next field. Particular attention should be paid to custom combine operations.

Composting manure

Many weed seeds can pass unharmed through the digestive systems of farm animals. Fine grinding of feed grains will reduce the number of viable weed seeds in the manure. Manure can also contain large quantities of weed seeds from the use of weed infested straw for bedding. Manure containing weed seeds should be composted for several months. The heating and decomposition that takes place during the composing process will destroy most weed seeds.

2. SANITATION

Sanitation is similar to prevention in that it prevents the spread of weeds into adjoining areas. An example of sanitation is the roguing (removal by hand) of single plants or small patches of plants from a field so that the weed cannot establish itself and spread throughout the field.

Sanitation can also be achieved by controlling weeds in areas such as fencelines, road allowances, sloughs, brush and stone piles, shelterbelts and other non-crop areas that harbour weeds that could invade cultivated fields. The control measures could consist of mowing, grazing, spot spraying with a herbicide, or biological control whichever is the most practical.

Many plants that can survive in the areas listed above are well adapted to invading fields that are under some form of reduced tillage system. Therefore, where tillage has been reduced as a soil conservation measure, sanitation becomes an increasingly important part of the overall weed management strategy.

3. CULTURAL CONTROL

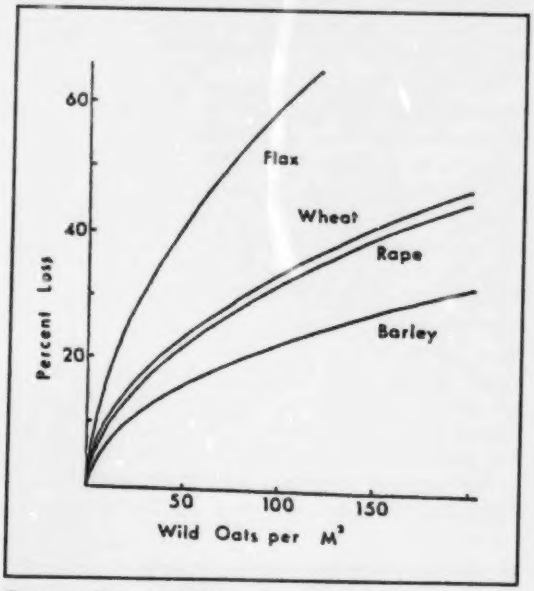
Cultural control of weeds includes everything that can be done to changes the immediate environment of the weed so that the competitive ability of the weed is reduced or the competitive ability of the crop is increased, or both. Cultural control methods are determined and controlled by farmers and their success depends, to a large extent, on farmers management ability and persistence.

It is important to remember that in putting together an overall crop management program, many cultural considerations other than weed control must be taken into account. Therefore, not all of the measures discussed here will be appropriate for all situations. The most appropriate combination of cultural controls and the level of each that is applied must be determined for each situation and this is where the skill and knowledge of the farm operator becomes very important.

Crop Selection

Crops vary tremendously in their ability to compete with weeds. Some, such as the winter cereals, spring barley and oat are very competitive. Others, like flax and lentil cannot compete very well at all. Thus the choice of what crop to grow in a particular field should be based, at least in part, on the weediness of the field and the ability of various crops to compete. Seeding lentil into a field that is known to be heavily infested with weeds is asking for a disaster, but seeding barely into the same field may result in little or no loss due to weed competition. A example of the different competitive ability of crops is illustrated in Figure 2.

Figure 2. Influence of wild oat density on yield loss.



Source: Dew, 1978.

Crop Rotation

When the same crop is grown on a field for many years in succession, certain weeds will increase in number. Rotating crops allows the use of a wider variety of cultural practices on a field over the course of a few years and this can prevent the build-up of any one particular weed species. For example, continuous cropping a field to wheat for several years can lead to the build-up of perennial weeds such as Canada thistle.

Seeding the field down to a competitive forage crop and mowing it twice a year could bring the thistle under control. The decision as to what crop rotation to follow is influenced by many factors. However, the role that crop rotation can play in the effective control of weeds should not be overlooked when those decisions are made.

Seed Quality

The importance of using clean seed has been dealt with earlier. Other aspects of seed quality that are important in maximizing the competitive ability of a crop are seed germination and seed size. The use of large seeds with a high gemination percentage will help to ensure the establishment of uniform stand of vigorous crop seedlings that will be able to compete more effectively with weeds.

Seeding Date

Seeding crops near their optimum seeding date will also help to increase the competitiveness of the crop. Seeding crops into soil that is too cold will delay crop germination and emergence. This delay gives disease organisms more opportunity to attack the seeds and the young seedlings. The result may be a thinner stand and weakened crop seedlings or both, which reduce the ability of the crop to compete with weeds.

Most weeds and field crops will germinate in relatively cool soils but a few weeds, like green foxtail, do not begin to germinate until the soil temperature has reached at least 10-15°C. In such cases, early seeding will place the crop at a considerable advantage over green foxtail. Crops such as flax, however, do not germinate quickly when placed into cool soil so the soil should be allowed to warm before seeding.

Delayed seeding for wild oat control has been practised for many years. Fields are worked very lightly as early as possible in the spring to warm and aerate the soil to stimulate germination of the wild oat seeds. When the wild oat seedlings have emerged, they are worked down. In some cases, the field may be left to allow another flush of wild oat to emerge and be worked down. A short season crop such as barley or Polish canola is seeded as soon as possible after the wild oat plants have been killed. This technique can provide effective wild oat control, but it has some disadvantages. Delaying the seeding of almost any field crop beyond the optimum date nearly always results in some reduction in yield. In addition, the tillage required for weed control may dry out the seedbed to the point where seed germination and crop stand are reduced. Delaying the seeding operation also increases the chance of frost injury to the crop in the fall. Results of research into delayed seeding on the prairies is presented in Figures 3 and 4.

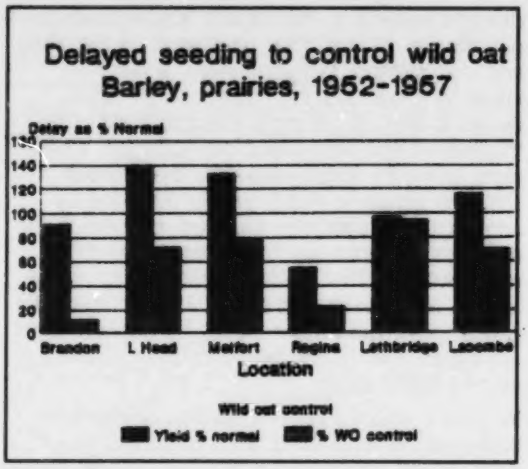


Figure 3

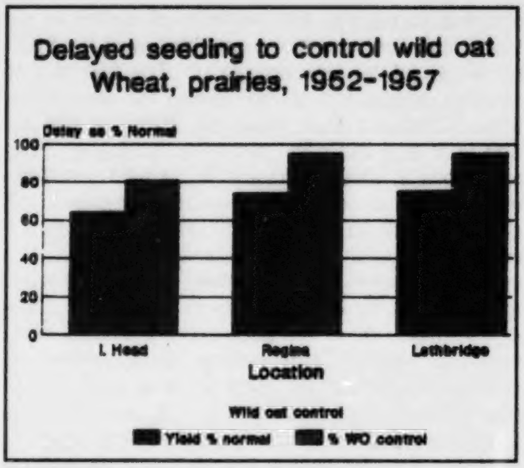


Figure 4

These data show that delayed seeding gave good control of wild oat in nearly all cases. However, barley yield increased in response to the wild oat control only in about one half of the cases and wheat yield declined in all cases in spite of 80% or better wild oat control. From these results it appears that barley is better suited to delayed seeding for wild oat control than is wheat.

One final aspect of seeding date should be considered. When seeding a crop into a field that contains a herbicide residue that could potentially damage the crop (seeding wheat into a field with trifluralin residue, for example) seeding should be delayed until the soil has warmed up. This will help to ensure rapid germination and will reduce the chance of herbicide injury to the crop which could reduce its competitiveness.

Seeding Rate

Increasing the seeding rate of the crop can increase the amount of competition exerted against weeds. Usually the seeding rate is increased by about 25% over normal levels for the area. This technique should only be considered in areas and years that have enough moisture to support the increased number of crop plants.

Row Spacing

Row spacing affects the length of time it will take for the crop to develop a canopy that will shade all of the soil surface in the field. The wider the row spacing, the longer this process will take. Many studies have shown that planting in narrow rows (approximately 8 cm (3 in.)) will increase the competitiveness of most crops. However, a compromise must be made between optimum row spacing for weed control and the practical limitations of equipment design. Traditionally cereal crops are seeded in 15-17.5 cm (6-7 in.) rows. Wider row spacings will make it easier for weeds to establish between the rows before the crop canopy closes in. The less competitive crops will, naturally, tend to suffer more from wider row spacing than will crops such as barely and wheat.

Seeding Depth

Tillage depth should be kept to the minimum required to prepare the seedbed, in order to avoid excessive drying of the soil to allow for rapid germination and emergence of the crop. Crop seeds should be planted as shallow as possible to ensure that they emerge from the soil quickly. This will provide the crop with the maximum opportunity to establish itself ahead of most weeds.

Plant Nutrition

Crop plants can only grow vigorously if they have an adequate supply of the plant nutrients that they require. Therefore, a good soil fertility program is a key factor in producing a competitive crop. Placement of phosphorous fertilizer close to the crop seed will give the crop a competitive advantage over the weeds. Banding of nitrogen fertilizer near the crop seed may give some advantage to the crop in the initial stages, but this advantage is probably very short lived because nitrogen is mobile in the soil.

Smother Crops

A smother crop is an aggressive crop that is established to compete with weeds and to gradually weaken the weed stand so that it can be controlled by other means. Fall rye is a very competitive crop that may be seeded in a very weedy field to suppress the weeds that are present. The crop may then be cut for green feed or worked down as a green manure crop and this constitutes another form of control. Finally the field may be summerfallowed for the remainder of the growing season. The use of a smother crop is this fashion allows the use of three different cultural measures in the space of one year and can often result in significant reductions in weed numbers in the field. Another example of the use of smother crops is the planting of alfalfa alone or in combination with a competitive grass such as brome grass or crested wheatgrass. Establishing such a stand and cutting it for hay for a number of years can significantly reduce the population of annual and perennial weeds. Tame buckwheat is another crop that is sometimes used as an annual smother crop. In this case, the crop and weeds are often worked into the soil before they have set seed and the field is then summerfallowed for the remainder of the season.

4. MECHANICAL CONTROL

As the name implies, mechanical control of weeds involves some form of mechanical operation, either directly to the weeds or indirectly to the area in which they grow.

Tillage

Tillage is probably the most obvious and widely practised form of mechanical weed control. Although intensive tillage may provide effective weed control, it is not recommended where the soil is exposed to increased wind or water erosion. It should also be noted that control results are often variable, especially with post-seeding and post-emergence tillage.

Preseeding Tillage

Most tillage is carried out before seeding and has the combined objective of seedbed preparation and weed control. Annual, biennial and non-creeping perennial plants can be killed by uprooting them and leaving them on the surface to dry out, particularly in hot, dry weather. Creeping perennial plants are killed by depleting their underground food reserves and by dragging their roots or rhizomes to the surface where they dry out or are killed by freezing temperatures. Usually several tillage operations will be required to deplete all the food reserves of deep rooted perennials such as Canada thistle or field bindweed. Top-growth of these weeds should be worked down when it is 5-7.5 cm (2-3 in.) tall so that the plants do not get an opportunity to restore their underground food reserves.

With more shallow rooted perennials such as quackgrass, more physical damage can be done to the root system. In dry years, using a cultivator with narrow spikes will generally be most effective as this will drag large amounts of rhizome material to the surface where it will dry out and die. This is often referred to as the "drag and dry" method. In wetter years, a disc implement that cuts the rhizomes into small pieces is likely to be most effective. Each rhizome section with a bud can establish a new plant, using it's food reserves in the process. If this new growth is subsequently disturbed by another tillage operation the food reserves in the rhizomes will gradually be depleted and the plants will die. This method is referred to as the "shred and starve" method. Whichever method is used, new growth should not be allowed to get more than 5 to 7.5 cm tall (2 to 3 in.) before it is worked down again.

In general, more than one season of intensive tillage will be required to achieve control of a deep rooted perennial weed (e.g. Canada thistle). Tillage should commence when the plants reach the early bud stage and should be repeated as required as described above. Tillage should continue throughout the summer and fall until freeze-up. Failure to carry through to the end of the growing season will reduce the effectiveness of the tillage program because perennial weeds are able to replenish the food reserves in their roots very quickly if they are left undisturbed in the fall.

Relying on intensive tillage to control perennial weeds as described above should be approached with caution as it can create a serious soil erosion problem especially when it is carried out on a large area. Where soils erosion is a major concern, tillage should be integrated with other weed control methods to ensure that the soil is well protected.

Small seedlings can also be killed by being buried with soils. Tillage will be most effective when the soil surface is dry and air temperature is high. Tilling very small seedlings when the surface soils is moist and temperatures are low will usually produce poor results as many of the seedlings will be transplanted rather than killed.

Post-Seeding Tillage

While most tillage is carried out prior to seeding the crop, it is possible to carry out some tillage for weed control after seeding and even after the crop has emerged. Annual weeds that are emerging ahead of the crop can be controlled by harrowing or rod-weeding. Best results will be obtained on a warm, windy day when the soil surface is dry as this will result in rapid drying and death of the seedlings. Tilling on a cool day when the surface soil is moist may simply result in transplanting many of the seedlings. **Tillage can be carried out any time before the crop sprouts have extended into the tillage zone.** Care must be taken to avoid damaging the shoots or crop emergence and establishment will be reduced.

Post-emergence Tillage

Harrowing the crop after it has emerged is another possibility. Cereals can be harrowed in the seedling stage (before tillering). If post-emergence harrowing is being considered, it is a wise precaution to seed somewhat deeper than normal and to increase the seeding rate by up to 25% to allow for damage that may be done to the crop stand. Seeding with an implement that ensures uniform seed depth will also help to minimize damage to the crop.

Harrowing in the direction of the seed rows on a warm, dry day will increase weed control and reduce crop injury. This treatment is more effective on shallow germinating weeds. The recommended crop stages for post-emergence harrowing are as follows:

Wheat	Between the 2 and 4 leaf stage (before tillering).
Barley	Between the 2 and 4 leaf stage (before tillering). Barley is more tender than wheat.
Oat	Oat is much more susceptible than wheat or barley to damage. Post-emergence harrowing is not recommended.
Sunflower	Up to the six leaf stage. Harrow across the rows. Adjust the seeding rate to make up for the approximately 5,000 plants/acre that will be lost each time the crop is harrowed.
Fababean	Harrow across the rows when the crop is between 5 - 15 cm (2-6 in.) tall and the plants are dry.
Lentil, Field Pea	Harrow in the seedling stage (no more than 10 cm (4 in.) tall). The crop must be dry to minimize the spread of disease. Use tine harrows only. Lentil is more sensitive than pea. Increase seeding rate by up to 15% to compensate for potential thinning.
Caution:	Post-emergence tillage is not appropriate for shallowly seeded crops, particularly small seeded crops such as canola, mustard and flax.

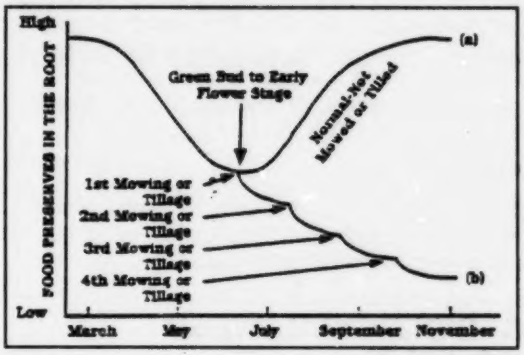
Post-Harvest Tillage

Tillage in the fall after harvest can help to control winter annual, biennial and perennial weeds. The tillage should be shallow to avoid burying weed seeds too deeply. Blades or sweeps should be used to conserve as much trash as possible to guard against erosion.

Summerfallow Tillage

Summerfallow tillage should be kept shallow to avoid bringing weed seeds up from deeper in the soil. The preservation of trash cover on the field should have high priority, so the use of implements such as wide-blade cultivators and rod-weeders is recommended. Where tillage is needed to control perennial weeds, weed patches should be worked separately and equipment should be cleaned before moving to the next patch to avoid spreading the weed over the entire field. One summer of intensive tillage can result in good control of weeds such as Canada thistle, perennial sow thistle and quack grass. However, more persistent perennials such as field bindweed, hoary cress and Russian knapweed usually require two consecutive years of intensive tillage to starve their root systems. Intensive tillage can provide effective control, but has the potential to create severe soil erosion problems. Tillage of perennial weeds should continue as required until freeze-up. Food reserves of perennial weeds decline until the plants reach the bud to early flowering stage, as shown in Figure 5.

Figure 5. Effect of mowing or tillage on root reserves.



Tillage (or mowing) should begin when the food reserves are at their lowest point. To continue to starve the root system, tillage should be repeated when the regrowth reaches about 7.5 cm (3 in.) tall. If this is continued until freeze-up, the plants will enter the winter in a very weakened condition and many of them will not survive. Those that do will not be vigorous and so will be more susceptible to control measures applied in the following year and less able to compete with crops.

Mowing

Mowing can provide effective control of upright growing annual and biennial plants. Repeated mowing of perennial plants is required to deplete the food reserves in their root systems. Annual and biennial weeds should be mowed before the first flowers open as many weed species can produce viable seeds within a few day of flowering. Grass weeds should be cut before heading. Perennial weeds should be cut at the bud to early bloom stage and the regrowth should be cut often to starve the root system.

Burning

Burning stubble fields is not recommended as a weed control measure because the loss of organic matter is greater than any weed control benefit that may be gained. Burning straw and stubble will kill a few weed seeds but it does not usually have any significant effect on the weed population. Most stubble fires do not generate high enough temperatures over a long enough period of time to destroy weed seeds.

Cutting and windrowing patches of weeds and burning the windrows can be an effective way of reducing weed populations around sloughs and other non-crop areas.

Fire can be used to control brush and other woody perennials on pastures, rangelands and along rights-of-way. However, this is not usually a practical proposition due to the problems involved in controlling the burn.

Water Management

Several weed species such as water smartweed and marsh ragwort thrive in wet areas and are very difficult to control where growing conditions are favourable. Control of such weeds usually depends on improving the surface drainage of the area so that the growing conditions are permanently altered to discourage their growth.

Mulching

The use of mulches is a common weed control technique in horticultural production but is not well suited for use in field crops.

5. BIOLOGICAL WEED CONTROL

Biological control of weeds is the use of parasites, predators and pathogens to regulate the population of a particular weed. Many of the problem weeds that flourish is western Canada were introduced to this area from Europe and western Asia by the early settlers. While they brought the weeds with them, virtually all of the natural enemies that attack those weeds were left behind.

The classical approach to biological control is to import a weed's natural enemies and establish them on the infestations here in Canada to reduce the growth of the weed. Before this can be done, however, the insects must be screened carefully to make sure that they will not feed on any desirable plants that grow anywhere in North America. Once the screening process is completed, experimental colonies are established to determine the requirements and impact of the biological control agent. Then regional colonies are established to serve as public distribution centres. Examples of the successful introduction of biological control agents for weed control in Saskatchewan are as follows:

- nodding thistle seed head weevil (*Rhinocyllus conicus*) for the control of nodding thistle (*Carduus nutans*).
- black dot spurge beetle (*Aphthona nigriscutis*) and brown dot spurge beetle (*Aphthona cyparissiae*) for the control of leafy spurge (*Euphorbia esula*).

6. ALLELOPATHY

Allelopathy is any direct or indirect harmful effect of one plant on another through production and release of chemical compounds. Although research in this area looks promising, more research is required before weed control recommendations can be given.

7. BIOLOGICAL HERBICIDES

Biological herbicides are being developed from naturally occurring organisms. They are used in the same manner as traditional herbicides to give temporary weed control at the site of application. There are no biological herbicides registered in Canada at the time of printing.

PART II - CHEMICAL WEED CONTROL

Foreword

Chemical weed control should be regarded as only one part of an overall weed control program on the farm and should not be relied on as the only method of protecting crops from weeds. Thus, herbicide treatments should be used only where they are required to supplement good cultural and mechanical weed control practices. The best weed control method is a strong vigorous, competitive crop. For sources of additional information, see page 127.

How to use this book:

Begin by referring to the fold out chart in the centre of the book. Use the chart to determine the herbicides that can be used for your crop-weed combination. Then refer to the appropriate product reference pages for information on use of the products that can be used in your situation. Use these pages to help select the most appropriate herbicide.

All rate recommendations in this publication are in terms of the actual amount of the product to be used.

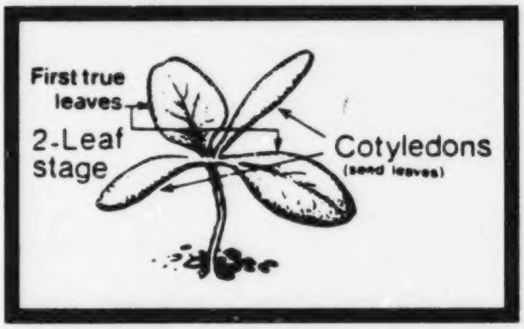
Factors that affect herbicide performance

The effectiveness of any given herbicide is affected by a large number of factors.

Thus, results often vary from year to year and from location to location. Knowledge of these factors and how they affect the performance of different products will help to avoid situations that may result in reduced control.

1. **Use the Right Herbicide** — The choice of herbicide depends on the type of weeds in the crop and the tolerance of the crop to various herbicides.
2. **Weed Resistance to Herbicides** — Another factor to consider is that weed resistance to a herbicide may occur when the repeated use of that same herbicide selects for naturally occurring resistant plants. The development of weed resistance is most likely to occur in a cropping system where the same weeds are repeatedly exposed to soil residual herbicides having the same mode of action.

   Kochia and Russian thistle resistance to sulfonylurea herbicides (ie: Glean, Ally, Refine) has been found in some fields in Saskatchewan. Green foxtail (wild millet) tolerant to trifluralin herbicides (Heritage, Advance, Free Flow, Rival, Treflan, Triflurex) has also been found. DO NOT use these herbicides repeatedly in the same field. To delay selection of resistant weed populations, rotate the use of these herbicides with other herbicides effective on the same weeds. When using a sulfonylurea herbicide (ie: Glean, Ally, Refine) it is appropriate to tank-mix with 2,4-D or MCPA where registered. Refer to product label to determine which tank mixtures are registered.
3. **Spray Early** — Weeds are easier to kill when young. Early weed eradication removes competition, saves moisture and increases yields. Crop stage must be considered.
4. **Apply the Correct Rate** — Using a properly calibrated sprayer. Do not reduce recommended rates.



5. **Growing/Soil Conditions** — The following factors can all influence herbicide performance.
   (a) Growing conditions - In general weeds are easiest to kill when they are small and growing rapidly. Translocated herbicides (eg. 2,4-D, Banvel) work best when weeds are actively growing. Contact type herbicides (eg. Pardner) usually do not lose as much activity when growing conditions are less favourable. Crops are generally more subject to damage when they are under stress.
   (b) Temperature/Humidity - High temperatures and low relative humidity result in rapid drying of droplets and herbicide loss due to evaporation. Crop injury may be increased with some products when temperature and humidity are both very high. Better weed control usually results when herbicides are applied during the cooler parts of the day.
   (c) Soil Moisture, Organic Matter, Texture - Soil incorporated herbicides are affected by these three factors. Weed control is best when soil moisture conditions are good. Excessive drying of the soil during incorporation procedures will reduce their effectiveness. Granular formulations generally require more soil moisture than liquid formulations for similar results. Soils high in organic matter and/or clay will require higher rates of herbicide to obtain adequate control.

(d) Rainfall - All products require a rain-free period after application to allow time for the weeds to absorb the chemical. Depending on the product, this period can range from 15 minutes to six hours or more.

(e) Water Quality/Temperature - Extremely hard water or water containing large amounts of silt will inactivate some products resulting in nozzle plugging and reduced weed control.

(f) Crop Competition - Many products depend on vigorous crop competition to assist in obtaining good weed control. Use of such products in unthrifty crops is not likely to be economical.

6. **Water Volume** — Good penetration of the crop canopy and good coverage of the weeds is essential for good weed control. Unless otherwise stated on the label, products should be applied in at least 100 L of water/ha (40 L/ac).

Proper Use of Herbicides — It is an offence under the Pest Control Products Acts of Canada and Saskatchewan to use a herbicide in a manner other than as stated on the label. The user of these products has the responsibility to take every precaution to avoid harmful side effects from the use of herbicides. Great care should be taken to avoid the contamination of water sources when filling sprayers.

Always Read the Label and Observe All Precautions

Reduce Spray Drift — Use Amine or Low Volatile (L.V.) formulations of 2,4- D. No safe distances can be given.

— **Use Lots of Water** — Use of 90-110 L/ha (35-45 L/ac) will result in fewer small, "driftable" droplets.

— **Use Low Pressures** — 240-300 kPa (35-44 psi) is the recommended operating range for flat fan nozzles. Consult recommendations or product labels for specific requirements for various products.

— **Use 80 or 110 degree nozzles** — 80 degree nozzles can be run approximately 10 cm (4 in.) closer to the target weeds than can the traditional 65 degree nozzles. 110 degree nozzles can be run 10-20 cm (4-8 in.) closer than 65 degree nozzles. This lowering of boom height reduces exposure of the spray droplets to the wind and results in reduced droplet drift. 80 degree nozzles (designated as 80 degree LP nozzles) designed to operate at pressures as low as 100 kPa (15 psi) are available and should further reduce drift hazards. Do not use flood jet or hollow cone nozzles unless specified on the herbicide label.

— **Do Not Spray** when winds are blowing toward sensitive plants or when wind velocity is high enough to cause significant drift.

Chemical Injection Systems

Chemical injection systems on sprayers are designed to avoid tank mixing of herbicides or other pesticides. One or more chemical tanks or containers may be provided. The second chemical may be applied continuously or there may be a provision to apply it, as desired for spot treatment of patches or smaller areas of certain weeds. The use of chemical injection systems permits the retrieval of left-over chemicals and spot treatment with a second chemical, both of which can provide substantial saving in chemical cost.

Precautions are necessary to obtain good results and to avoid possible problems when mixing chemicals. The following should be considered when spraying with chemical injection systems.

1. The flow or application rate of each chemical must be calibrated. Since flow rates are often quite low, the settings may have to be precise depending on the metering system that is provided.
2. Only chemicals approved for tank-mixing can be applied. Chemical application without tank-mixing is expected to give the same results as tank-mixing, although field results are not available. Chemical injection systems that provide mixing of each chemical separately with water are preferred, rather than mixing the chemicals together before mixing with the water in the line. Mixing of undiluted chemicals may cause objectionable or hazardous results.
3. Certain chemicals that are designated as WP (wettable powder), WDG (water dispersible granule), DF (dry flowable) are not suitable for use in chemical injection systems. WSP (water soluble powder) could be used, but the user would have to dissolve the powder, work out the application rate of the solution and apply accordingly. Some WSP chemicals may not dissolve completely in small volumes of water and could cause significant problems.
4. Thorough cleaning of chemical tanks and lines are required when changing from one chemical to another. Small residues can cause severe injury to some crops.
5. The time required for a chemical to reach all sprayer nozzles, after it is switched on, may be more than 1 or 2 minutes depending on the sprayer system design. Large or wide sprayers retrofitted with injection systems without altering the boom pipe or plumbing will have longer delay times. This is important for spot treatment since the travel distance in 1 or 2 minutes can be several hundred metres depending on travel speed.

6. Gain a thorough understanding of the operating characteristics of the chemical injection system before using to ensure satisfactory results.
7. When handling undiluted chemicals take precautionary measures to minimize exposure. Adopt protective measures by using proper protective equipment and good personal hygiene.

Wetting Agents

Most herbicides contain sufficient wetting agent in the formulated product. Addition of extra wetting agent is not recommended unless the product label so recommends. Use only wetting agents that are registered for use and carry a Pest Control Products registration number on the label.

Herbicide Container Disposal

Problems and Potential Dangers of Indiscriminate Disposal of Waste Containers:

(i) Potential contamination of ground and/or surface waters if used containers are left lying near wells, streams, dugouts or in areas with high water tables.

(ii) Many residues left in containers are toxic to fish and other forms of wildlife.

(iii) Potential access by members of the public to dangerous chemicals is cause for concern. This is especially so with children playing with the used containers.

Procedure for Disposal

Saskatchewan Environment has initiated a voluntary program for the collection and crushing of metal pesticide containers discarded by farmers and the disposal of associated residues.

Thoroughly rinsed containers may be delivered to collection sites selected by participating rural municipalities. Once delivered to the collection site, the containers must be deposited only within the fenced-in area specified and stacked on their sides to prevent rain water from entering and pesticide residues from escaping the containers. If a collection site has not been designated within a rural municipality, the current best method for agricultural container disposal is to rinse, crush and bury the containers on the user's own farm.

Rinse:

Rinse containers well and add the rinse water to the sprayer tank to reduce the chemical residue left in the container to a minimum. Whether triple or pressure rinsing containers, the contents of the container are first emptied into the spray tank and the container drained while held in a vertical position for at least 30 seconds. In the triple rinse procedure, a measured amount of rinse water or other dilutent is added to the container so that it is about one fifth full. The container is closed, shaken thoroughly and the rinsate drained into the spray tank. The rinse procedure is then repeated two more times. Pressure rinsers have the versatility to rinse all containers which can be lifted into position over the spray tank opening. These devices are constructed to be thrust through the bottom of a plastic or metal container and residual pesticide rinsed into the spray tank using a pressurized water source. The pressure rinsers have the added advantage of rendering the containers useless for other uses by automatically puncturing them. All rinsing procedures should take place away from wells and surface waters.

Crush:

All containers should be crushed as best as is practical to render them useless for any other task and to assist in the burial process.

Bury:

The burial site should be an uncropped area away from wells, ponds, streams, or livestock feeding areas. There should be little or no runoff and the water table in the area should be at least three (3) metres below the soil surface. A clay or loam soil is most suitable for the burial site. The area of disposal should be marked or recorded.

Bury containers at least thirty (30) cm below the surface. Compact the backfill to retard seepage.

Incorporation of Soil-Applied Herbicides

The recommended procedures for mixing or incorporating pre-emergent herbicides into the soil are given by the manufacturer of the herbicide. Long term studies have shown that such procedures will usually give the desired result. Exceptions occur though, due to the wide variety of soil and climatic conditions. Appropriate changes in the incorporation procedures can be of benefit under certain conditions. Some of the principles involved in the incorporation of herbicides are discussed below.

Herbicide: Different herbicides may require a different depth of incorporation for maximum effectiveness. The depth may vary depending on the prevalent weed to be controlled and the crop to be grown. For example, Treflan should be mixed relatively deeply for control of wild oats whereas a shallow depth is better for control of green foxtail. Be sure to read the label requirement. Coarse textured (sandy) soils and those soils with low organic matter may require different rates of herbicides than other soils.

Soil Condition: Loose, mellow soils are ideal for mixing the herbicide uniformly to the desired depth. Hard and lumpy soils, and those which are wet and sticky make it difficult to get uniform and proper mixing. Different incorporation procedures are likely required for such soils. Dry soil will, in many cases, limit herbicide activity. An incorporation procedure that dries out the soil just before seeding or even after seeding can result in poor weed control and poor emergence of the crop. Timing and the method of the incorporation is important where weather conditions will dry out the soil very quickly. Referring again to hard lumpy soils; the type of herbicide used, that is liquid or granular, can determine the procedure to use for incorporation. Granules placed on hard lumpy soil before incorporation can fall between the lumps and go too deeply, whereas liquid is attached to the soil. Therefore, if granules are to be used, it may be necessary to prework the soil to get it into a condition where the granules will be mixed within the desired soil layer. Careful assessment of the condition is required. Such lumpy or sticky soils may require several operations to get them into a good condition for proper incorporation. Many operations though, can also further dry out the soil making it unsuitable for the crop to be planted.

The other extreme is the very loose soft soil where the recommended procedure for incorporation may leave the soil so fine that it will be subject to both wind and water erosion. Although this condition may be ideal for incorporation, the loss of eroded soil is costly. In this case soil incorporation should be avoided if alternate methods of weed control are available.

Equipment for Incorporation: All kinds of tillage equipment can be used to incorporate herbicides, but the choice depends on the herbicide to be used, its preferred location in the soil, the condition of the soil and the availability of such implements. The depth and speed of operation are also important. The incorporating action of various implements are discussed below.

Tandem disc harrows, discers and any kind of disc type implement will provide deeper incorporation, more soil breakdown, faster and more uniform mixing to the depth of tillage than most other implements. These should be used where deep incorporation is needed, where the soil is lumpy or sticky and where soil erosion is not considered to be a problem.

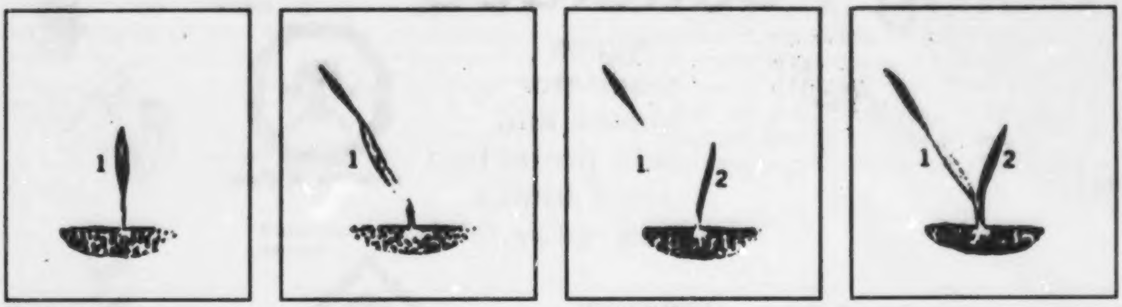
Cultivators of all kinds can be used but tend to give shallower incorporation. Deep tillage (10 cm (4 in.) or more) will give less soil disturbance than a shallower operation. For good mixing a high travel speed is necessary; a speed high enough to throw soil upward and sideways will give more even incorporation. Higher speeds also help to break up lumps, but in loose soils will contribute to possibilities of erosion. Any kind of cultivator can be used (even hoe-drills will work), but shank spacing, speed, depth and kind of sweeps affect how well the incorporation is done. Harrows are very useful for shallow incorporation but the soil needs to be loose if they are used; otherwise incorporation will be very shallow. Tine harrows behind cultivators contribute to better mixing due to the lively action of the tines. Drag harrows on stubble fields may not work very well for incorporation if they are constantly loaded with a lot of trash. Rotary or oscillating harrows are quite effective in trashy field conditions.

Rod weeders and wide blade machines are not capable of mixing herbicides in the soil and cannot be recommended for that purpose.

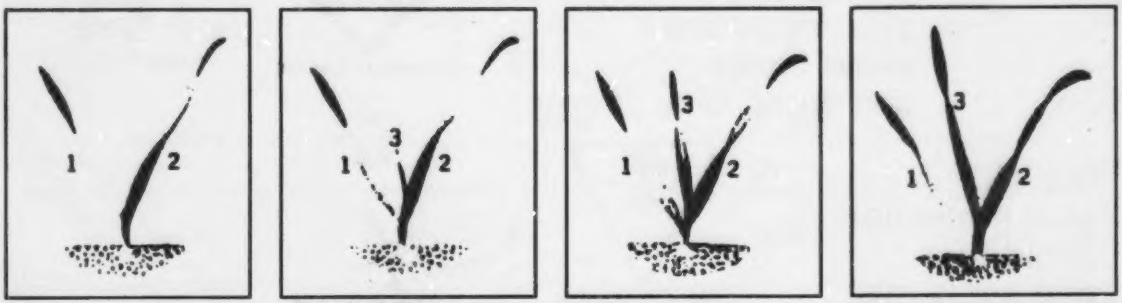
In stubble the most effective incorporation of liquid is obtained if the field is first worked until about two thirds of the surface is black. Bunches of straw and chaff left on the field will absorb the liquid and therefore good straw spreading at harvest time is important. Granules can be applied directly to stubble before tillage but as with the liquid herbicides the bunches of straw should be spread. The spray boom or granular attachment behind discers is also a very effective method for simultaneous application and incorporation when seeding stubble crops, as well as on summerfallow. Weed or volunteer crop growth on fields will also absorb liquid herbicide.

In summary it can be said that precaution and a careful assessment of the field, climatic conditions and herbicide requirement is needed before deciding on the incorporation procedure. If conditions are extreme, either more or less incorporation action will be needed. Do not overwork if not needed, but do enough to ensure the proper mixing and to get the herbicide in the right location.

Leaf Stages of Cereals



One-Leaf Stage — Two-Leaf Stage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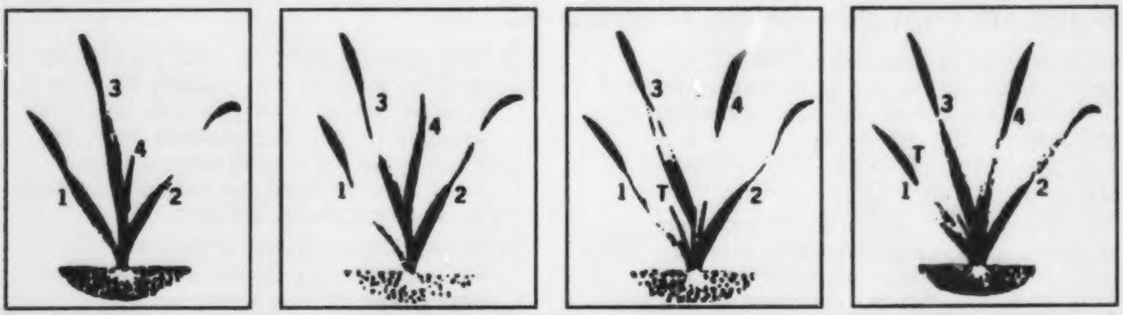
Three-Leaf Stage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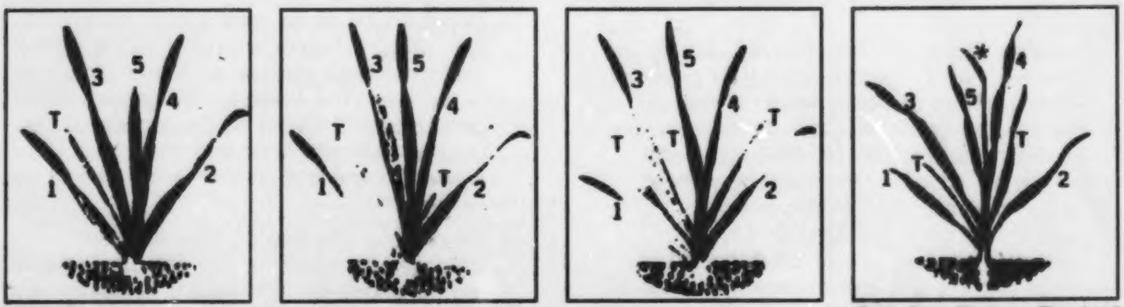
Four-Leaf Stage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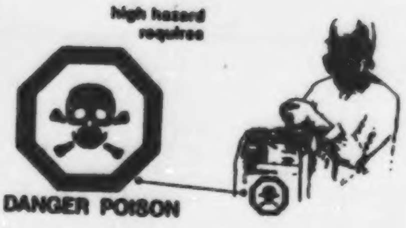
Five-Leaf Stage — *Early Shot Blade or Flag Leaf

NOTE: The above drawings are a guide in following recommendations for herbicide application to wheat, oats, barley and rye. As an example, the two-leaf stage extends from the time the second leaf begins to emerge and continues until the third leaf begins to emerge. Tillers (T) are not counted as leaves.

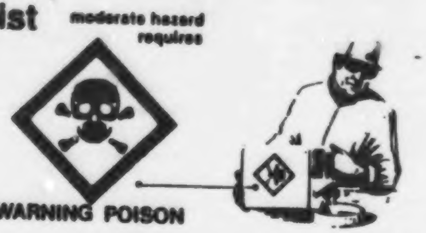
Using Pesticides

protect yourself!

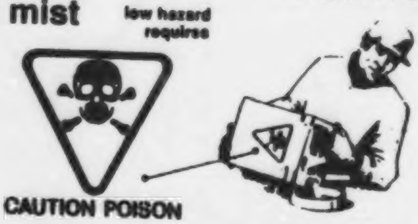
goggles
respirator
gloves and
skin protection
avoid fumes
and spray mist



goggles
gloves and
skin protection
avoid fumes
and spray mist



gloves and
skin protection
avoid fumes
and spray mist



Standard Pesticide Safety Precautions

For each level of hazard illustrated above, certain safety precautions to minimize exposure are required. The level of hazard is indicated on the pesticide label, unless the pesticide is considered non-toxic. In this case, no symbol will appear on the label.

To minimize exposure, pesticide applicators should adopt adequate protective measures by using proper protective equipment and good personal hygiene. Safety equipment is available in Saskatchewan from safety equipment suppliers, farm supply stores and some elevators.

1. Coveralls: Long sleeved coveralls over clean work clothing will provide increased protection against dermal exposure resulting from drift, splashing or spills. Reusable cotton coveralls are washable and can be used repeatedly. Disposable coveralls and reusable unlined rubber coveralls are also available. If coveralls become damaged or severely contaminated, they should be discarded. All cotton clothing and cotton coveralls should be washed daily (separate from all other wash) in hot water and detergent, rinsed and dried.
2. Footwear: Wear knee length rubber or neoprene unlined boots. The legs from the coveralls should be outside the top of the boots. Since both leather and canvas readily absorb pesticides, contaminated footwear made of these materials will continually expose the feet to pesticides.
3. Head gear: A waterproof wide brimmed hat or hard hat equipped with a plastic sweat band is recommended. Cloth type hats should not be worn, as they readily absorb pesticides. Washing will not remove pesticides from these caps, therefore the scalp and forehead would be continually exposed.
4. Gloves: Unlined rubber or neoprene gloves are recommended. Do not wear leather or cloth gloves, as they readily absorb pesticides. Sleeves of coveralls should be worn over the gloves.
5. Goggles: Should be worn during mixing and tank filling, container rinsing or during sprayer maintenance to prevent accidental exposure to the eyes. The straps on the goggles should be of plastic or rubber so the goggles can be washed daily with soap and water. Gas permeable and soft contact lenses should not be worn.
6. Respirators: The use of respirators and cartridges approved for use with pesticides is recommended for high hazard pesticides. A good rule of thumb to follow is use of a respirator to minimize inhalation exposure when handling all pesticides. The cartridges should be changed when odours are detected through them, when breathing is restricted, or according to manufacturer's instructions. When not in use, the respirator and cartridges should be stored in a sealed plastic bag to prevent contamination and deactivation.

The Metric System

This publication presents information regarding spray volumes and application rates in a dual system. Where applicable, recommendations are made first in metric measure per hectare, followed by (approximate metric measure per acre) in brackets. **Herbicide labels will remain entirely in metric as required by the Pest Control Products Act of Canada.**

The majority of herbicides used in Saskatchewan are recommended to be applied in 100 litres of spray solution per hectare (40 litres per acre), at a spray pressure of 275 kilopascals (40 psi) and at a ground speed of 9 kilometres per hour (5.6 mph). These are standard application recommendations.

TABLE 1 Spray Volume
The Standard Application Volume is:
100 litres per hectare (L/ha) = 40 litres per acre (L/ac)
1 ha = 2.47 acres

Approximate Conversions

Litres per Hectare L/ha	Litres per Acre L/ac	Gallons per Acre gal/ac
45	18	4.0
50	20	4.5
60	25	5.3
100	40	8.9
110	45	9.8
150	60	13.4
165	65	14.7
200	80	17.8
220	90	19.6
300	120	26.7

TABLE 2 Spray Pressure
The Standard Spraying Pressure is:
275 kilopascals (kPa) = 40 pounds per square inch (psi)
6.9 kPa = 1 psi

Approximate Conversions

Kilopascals kPa	Pounds per sq. inch psi
100	15
150	22
175	25
200	30
250	35
275	40
300	44
350	50
425	60

TABLE 3 Ground Speed
The Standard Ground Speed for Spraying is:
9 kilometres per hour (km/h) = 5.6 miles per hour (mph)
1.6 km/h = 1 mph

Approximate Conversions

Kilometres per hour km/h	Miles per hour mph
6	3.8
7	4.3
8	5.0
9	5.6
10	6.2
11	6.8
12	7.5
15	9.3

Note: The maximum speed recommended for incorporation of soil applied herbicides is 8 km/h (5 mph).

TABLE 4 Application Volumes of Flat Spray Tips For the majority of herbicides used in Saskatchewan the Standard Nozzle Tips recommended are Delavan LF2-80 and Tee Jet 8002. At 9 km/h (5.6 mph) these nozzle tips will apply 100 litres of spray volume per hectare (40 litres per acre).

Nozzle Tip		Pressure	Capacity	Litres per hectare (Litres per acre)				
Delavan	**TeeJet**	**(kPa)**	**(mL/min)**	**6 km/h**	**8 km/h**	**9 km/h**	**10 km/h**	**12 km/h**
LF067-65° or 80°	650067 & 800067	275	250	50 (20)	38 (15)	33 (13)	30 (12)	25 (10)
LF1-65° or 80°	6501,8001 & 11001	275	378	76 (31)	57 (23)	50 (20)	45 (18)	38 (15)
LF1.5-65° or 80°	65015,80015 & 110015	275	566	113 (46)	85 (34)	76 (31)	68 (28)	57 (23)
LF2-65° or 80°	6502,8002 & 11002	275	756	151 (61)	113 (46)	100 (40)	90 (36)	76 (31)
LF3-65° or 80°	6503,8003 & 11003	275	1132	230 (93)	170 (69)	151 (61)	136 (55)	113 (46)
LF4-65° or 80°	6504,8004 & 11004	275	1512	305 (123)	230 (93)	202 (82)	181 (73)	151 (61)

NOTE: Nozzles spaced at 50 centimeters (20 inches)

For additional information regarding herbicide application and sprayer operation refer to A Guide to Field Sprayer Operation. This publication is available from Extension Agrologists.

TABLE 5 Area
1 hectare = 2.47 acres

Approximate Conversions

Acres ac	Hectares ha
1	0.4
2.5	1
5	2
10	4
15	6
20	8
25	10
30	12
40	16
50	20
60	24
70	30
160	64

TABLE 6 Spray Tank
1 gallon = 4.55 litres

Approximate Conversions

Gallons	Litres
100	450
110	500
150	700
200	900
220	1000
250	1100
300	1400
330	1500
350	1600
400	1800
440	2000
500	2300
800	3600

TABLE 7: Approximate Conversion Factors*

	Metric to Imperial		Imperial to Metric	
Metric Unit	**Multiply By**	**Imperial Unit**	**Multiply By**	**Metric Unit**
LINEAR				LINEAR
centimetre (cm)	x 0.39	inch	x 2.54	centimetre (cm)
AREA				AREA
square metre (m)	x 1.2	square yard	x 0.84	square metre (m)
hectare (ha)	x 2.5	acres	x 0.4	hectare (ha)
VOLUME				VOLUME
litre (L)	x 0.22	gallon	x 4.55	litre
PRESSURE				PRESSURE
kilopascals (kPa)	x 0.14	psi	x 6.9	kilopascals (kPa)
WEIGHT				WEIGHT
gram (g)	x 0.04 oz	avdp	x 28.35	gram (g)
kilogram (kg)	x 2.2 lb	avdp	x 0.454	kilogram (kg)
AGRICULTURAL				AGRICULTURAL
litres per hectare (L/ha)	x 0.089	gallons/acre	x 11.23	litres per hectare (L/ha)
litres per hectare (L/ha)	x 0.357	quarts/acre	x 2.81	litres per hectare (L/ha)
litres per hectare (L/ha)	x 0.71	pints per acre	x 1.41	litres per hectare (L/ha)
millilitres per hectare (mL/ha)	x 0.014	fl. oz per acre	x 70.22	millilitres per hectare (mL/ha)
kilograms per hectare (kg/ha)	x 0.89	lb per acre	x 1.12	kilograms per hectare (kg/ha)
grams per hectare (g/ha)	x 0.014	oz avdp/acre	x 70	grams per hectare (g/ha)

*EXAMPLE: To convert centimetres to inches, multiply by 0.39; conversely, to convert inches to centimetres, multiply by 2.54. CAUTION: Herbicide labels are only in metric units. Conversion between the Metric and Imperial system may result in confusion. It is recommended to use metric units only.

Product Amounts for Small Areas

Most recommendations are based on amount of product per acre. When applying a herbicide to a small area, use the following conversion, unless otherwise specified in the recommendations.

For a 1076 sq ft (100 m) area:

To convert from L/acre to mL/1076 sq ft (100 m), multiply by 25. [Eg. - 2.5 L/acre — use 62.5 mL per 1076 sq ft (100 m)].

A spray volume of 5.0 to 10L/1076 sq ft (100 m) is suitable for application using a hand sprayer. This is equivalent to 200 to 400 L/acre.

Advance 10G (trifluralin)

DowElanco

Activity: 10% granules

Registered Uses:

Crops	Recommended Rates of Product[1] Fall		Summer		
	2-6% O.M.	6-15% O.M.			
Canola, triazine tolerant canola, flax	11-14 kg/ha (4.4-5.7 kg/ac)	14-17 kg/ha[2] (5.7-6.9 kg/ac)	17 kg/ha (6.9 kg/ac)		
Lentils, sunflowers, fababeans, mustard, peas, dry beans, seedling alfalfa	11-14 kg/ha (4.4-5.7 kg/ac)	14-17 kg/ha[2] (5.7-6.9 kg/ac)	Not Recommended		
Barley	**2 - 4 % O.M.** 8.5-11 kg/ha (3.4-4.4 kg/ac)	**4 - 6 % O.M.** 11-14 kg/ha (4.4-5.7 kg/ac)	Not Recommended		
Wheat [3]	**2 - 8 % O.M.** 5.5 kg/ha[4] (2.2 kg/ac)			**1 - 3 % O.M.**	**4 - 8 % O.M.**
			May [5]	9.5 kg/ha (3.8 kg/ac)	11.0 kg/ha (4.4 kg/ac)
			June	8.0 kg/ha (3.2 kg/ac)	9.5 kg/ha (3.8 kg/ac)
			July	6.5 kg/ha (2.6 kg/ac)	8.0 kg/ha (3.2 kg/ac)

Summer Application: Canola, triazine tolerant canola, flax only - 17 kg/ha (6.9 kg/ac). Not recommended on light soils (sandy, sandy loam).

Weeds Controlled: Wild oats, green and yellow foxtail (wild millet), barnyard grass, Persian darnel, wild buckwheat, cow cockle, pigweed,lamb's-quarters, chickweed, purslane, knotweed.

[1] The rate of application will be determined by season of application, soil zone, percent organic matter and soil texture (light: sand, sandy loam / medium to heavy: loam, silt loam, silt, sandy clay loam, silty clay loam, loam, clay, clay loam, silty clay).

[2] Use 17 kg/ha (6.9 kg/ac) on medium to heavy textured soils (6-15% O.M.) with heavy wild oat infestation.

[3] Do not fall apply Advance 10G for wheat to stubble when the current year's crop had been treated with another trifluralin product, (eg. Free Flow, Treflan, Heritage, Rival or Triflurex). This includes application made in the spring or previous summer or fall. Do not apply Advance 10G to stubble or fallow when the previous year's crop was an oilseed, barley or pulse crop treated (in the spring or fall prior to seeding) with a deep incorporated trifluralin product, (eg. Free Flow, Treflan, Rival, Triflurex).

[4] Rate recommended for wheat will control green and yellow foxtail (wild millet) only.

[5] Weeds controlled will differ between fallow and crop year. Weeds controlled in the fallow year include green foxtail, wild oats, Persian darnel, barnyard grass, wild buckwheat, cow cockle, lamb's quarters, redroot pigweed, Russian thistle. Weeds controlled in the crop year include green foxtail, lamb's-quarters, wild oats, wild buckwheat.

Control of wild oats and wild buckwheat in the crop year may vary depending on weed population as well as soil and climatic conditions. However, weeds escaping the herbicidal action of Advance 10G will be effectively suppressed and growth retarded; therefore, resulting in limited competition to the wheat.

Application and Timing:

1. **DO NOT** apply to sandy soils with less then 2% organic matter. Application to severely eroded knolls is not recommended.
2. **DO NOT** apply to wet soils in poor working condition, peat or muck soils, soils subject to prolonged periods of flooding or soils which contain greater than 15% organic matter.
3. Apply at the recommended rates as it pertains to soil texture, organic matter and crop.
4. Advance 10G is best suited for use under trashy conditions and is recommended for SUMMER and FALL application only. If soil is hard or if trash cover is excessive, precaution is necessary to ensure adequate mixing of the granules in the soil. For best results, the second incorporation should be done before spring. Incorporate as outlined below for summer and fall applications.
5. Over application resulting from overlapping, non-uniform application or improper

calibration may result in delayed crop development, reduced crop stand or reduced yields.

Incorporation:

Refer to Incorporation of Soil Applied Herbicides section on page 12 for general incorporation procedures.

Fall - Apply between September 1 and freeze-up. Incorporate immediately in the same operation if possible. Do not delay incorporation more than 24 hours after application. It is preferred to do both incorporations in the fall followed by shallow tillage in the spring prior to planting. However, one incorporation may be done in the fall and the second in the spring to a depth of 8-10 cm (3-4 in). If both incorporations are completed in the fall, it is recommended that the second incorporation be delayed at least 3 days following the first. This allows time for greater release of Advance 10G onto the soil particles and assures more uniform distribution in the soil. Both incorporations should be performed at the same depth.

Summer - Apply between June 1 and September 1 and incorporate immediately in the same operation is possible. Do not delay incorporation more than 24 hours after application. Second and subsequent incorporations may be done any time prior to soil freeze-up.

For Oilseed and Pulse Crops

Incorporate immediately. The first incorporation is best done in combination with the application operation and should not be delayed more than 24 hours after application.

Two operations at right angles are required when applied in the summer or fall. The second incorporation can be delayed until spring, although two fall incorporations are preferred. When both incorporations are done in the fall, a shallow cultivation is required in the spring prior to planting.

Use a tandem disc, discer or vibrashank cultivator set to 8-10 cm (3-4 in) deep. Operate disc implements at 7-10 km/hr (4.3-6.2 mph) and cultivators at 8-10 km/h (5-6.2 mph). Rod weeders, harrows or hoe drills, deep tillage cultivators or chisel plows will not properly incorporate Advance 10G.

Special Instruction For Flax and Lentils

a. Both incorporations must be done in the season of application (fall) prior to seeding in the spring. Leave at least 3 days between incorporations.

b. The seedbed should be shallowly tilled (5-8 cm) and packed just prior to seeding in the spring to ensure a firm seedbed and accurate depth of planting.

c. Seeding should be done with a press or hoe drill. Seed into a moist seedbed no more than 4 cm (1.6 in) deep.

d. Do not seed flax early in May when soil conditions are cold. Seeding should generally not be prior to May 15. Conditions which result in slow germination and emergence will greatly increase the risk of a poor flax or lentil stand.

Special Instructions for Advance 10G Applied in Fall for Barley

a. Use the recommended rate as it pertains to soil type for barley.

b. Do not apply Advance 10G for barley on land treated with Advance, Free Flow, Treflan, Rival, Heritage or Triflurex since June 1 of the previous year.

c. Do not apply on grey wooded soils or other soils containing less than 2% organic matter, or on black/deep soils containing more than 6% organic matter. Application to severely eroded knolls can result in reduced crop stand.

d. General directions for "Land Preparation", "Application" and "Incorporation" are the same as for use on oilseed crops.

e. **Both incorporations of Advance 10G must be done in the season of application (fall).**

f. Seeding should be with a press drill or hoe drill. Seed into a moist, warm seedbed with the drill set to seed shallow (no deeper than 5 cm (2 in).

g. Use of discers and air seeders can result in uneven and variable seeding depth. If they are used for seeding barley, the field should be packed after the seeding to give a firm seedbed.

h. Do not seed early when soil conditions are cold.

i. Conditions which result in slow germination and emergence will greatly increase the risk of a poor barley stand.

Special Instructions for Use of Advance 10G on Summerfallow Followed by Wheat in Rotation

a. Apply Advance 10G to the soil surface and incorporate immediately in the same operation if possible. Ensure large clods are broken.

b. Do not delay incorporation more than 24 hours after application and incorporate with a field cultivator or disc implement. Set to work 5-8 cm (2-3 in.) deep at 8-10 km/hr (5-6.2 mph).

c. The second incorporation should be done no sooner than one week after application:

d. Subsequent workings may be done whenever necessary to destroy resistant weed growth during the remainder of the fallow year at a depth no greater than 8 cm (3 in.).

e. Subsequent operations after completion of the two fallow incorporations may be done with a rodweeder or shallow tillage to control resistant weed growth and more uniformly blend Advance 10G into the soil. These operations should be as shallow as possible to minimize surface trash burial and evaporation.

f. Advance 10G should not be incorporated with a cultivator when the soil is crusted, lumpy or too wet for good mixing action.

g. Incorporation deeper than 8 cm (3 in.) may result in erratic weed control and crop injury.

h. To reduce risk of wheat injury, use quality seed and agronomic practices which will promote good growing conditions; - avoid deep seeding, loose seedbeds and seeding into cold soils.

i. Semi Dwarf Wheat: special care should be taken to ensure shallow seeding.

Special Instructions for Fall Applied Advance 10G for Control of Green Foxtail in Wheat

a. 5.5 kg/ha (2.2 kg/ac) is the **maximum** rate for wheat. Higher rates will result in crop injury.

b. Do not apply Advance 10G for wheat on soil treated with Advance, Free Flow, Treflan, Rival, Heritage or Triflurex in the current or previous crop year.

c. Apply to summerfallow or standing or pre-worked stubble between September 1 and freeze-up with a properly calibrated granular applicator to soils with 2-8% organic matter levels.

d. Apply uniformly to the soil surface and incorporate immediately in the same operation if possible, Do not delay incorporation more than 24 hours after application.

e. Incorporate in two different directions at the same depth using a field cultivator, deep tillage cultivator or disc implement operated at 8-10 km/hr (5-6.2 mph) set to 5-8 cm (2-3 in.) deep. Incorporation with implements set to cut less than 5 cm (2 in.) deep or more than 8 cm (3in.) deep may result in erratic weed control or crop damage.

f. Both incorporations may be completed in the fall. If so, it is recommended that the second working be delayed at least 3 days following the first.

g. Do not incorporate with a field cultivator when the soil is crusted, lumpy or too wet for good mixing action. Rod weeders, harrows or hoe drills will not properly incorporate Advance 10G. If green growth is heavy (interfering with soil mixing), destroy existing growth before application either through cultivation or herbicide application. If the swath has been removed by burning, cultivate once to remove charcoal layer prior to application.

h. When only one incorporation is completed in the fall to conserve trash cover, the spring tillage should be done at an angle or cross direction to the fall incorporation with the implement operated at a 5-8 cm (2-3 in.) depth.When both incorporations are completed in the fall, shallow spring tillage (no deeper than fall incorporation) should be completed with a cultivator or disc implement.

i. Seed into a firm, moist, weed free seedbed using a double disc press drill or hoe drill set to seed 3-6 cm (1.2-2.4 in.) deep.

j. If a discer or air seeder is used for seeding, separate spring tillage may not be necessary. However, care must be exercised, such that the discer or air seeder is set to uniformly place the seed 3-6 cm (1.2-2.4 in.) deep and the seedbed should be firmly packed or harrowed after seeding to promote good germination.

k. To reduce the risk of wheat injury, use quality seed and agronomic practices which will promote good growing conditions; **avoid deep seeding, loose seedbeds and seeding into cold soils.**

l. **Application to severely eroded knolls is not recommended because crop injury may occur.**

Spring Tillage for Seedbed Preparation

a. All spring tillage following fall application of Advance 10G should be done when the soil is warm enough to promote germination, no deeper than fall incorporation.

b. When only one incorporation is completed in the fall to conserve trash cover, the spring tillage should be done at right angles to the fall incorporation at a 5-8 cm (2-3 in.) depth.

c. Avoid transplanting weed seedlings.

d. Seed into a firm, moist, weed-free seedbed using a double disk press drill or hoe drill set to seed 3-6 cm (1.2-2.4 in.) deep.

Mode of Action:

Advance 10G controls susceptible weeds by killing seedlings as they germinate. It does not control established weeds.

Precautions:

1. **Advance 10G will not control trifluralin tolerant green and yellow foxtail (wild millet). Trifluralin tolerant green foxtail populations have built up because trifluralin has been repeatedly used for many years as the major herbicide in a field. Populations of green foxtail tolerant to trifluralin herbicides have appeared in**

some areas of Saskatchewan. For further information regarding weed resistance to herbicides refer to page 9.

2. **Drought conditions in the year prior to seeding rotational crops such as wheat, may result in higher levels of Advance 10G in the soil. To reduce the possibility of injury to rotational crops, seed the crops shallow into a warm, moist seedbed.**
3. DO NOT use on oats, rye, triticale or forage grass.
4. Wheat and barley will likely be injured if seeded through a treated layer or into a deeply incorporated layer of Advance 10G.
5. DO NOT apply to peat or muck soils, wet soils, soils in poor working condition or soils which contain more than 15% organic matter.
6. Oats, canary seed and forage grasses should not be grown in rotation following an Advance 10G treated crop.
7. Used as directed and under normal conditions, Advance 10G will not harm the treated crop. However, seedling disease, cold weather, deep planting, excessive moisture, high salt concentration or drought may weaken crop seedlings and increase the risk of damage resulting in delayed crop development or reduced yields.
8. Avoid concentrating granules in narrow bands.
9. Ensure granular applicator is properly calibrated so that granules are applied uniformly and check frequently to see if equipment is working correctly.
10. Over application caused by overlapping, improper calibration, non-uniform application, etc. may reduce stands of crops that follow in rotation.
11. There are no grazing restrictions.
12. DO NOT store in direct sunlight.
13. DO NOT allow to sit in granular applicators for more than 24 hours.

Note: Speeds in excess of 8 km/h (5 mph) will result in excessive pulverization and trash reduction leaving fields susceptible to erosion. The maximum recommended tillage depth for Saskatchewan is 10 cm (4 in.). Fall application is not recommended on soils where a lack of trash cover combined with the required incorporation could result in soil erosion.

Afolan F (linuron) + MCPA (1:2) - Tank-Mix

Hoechst

Activity:		
	Afolan F	480 g active ingredient/litre
	MCPA amine	500 g active ingredient/litre

Registered Uses:

Crops
Wheat (spring, durum),
oats, barley

Recommended Rates of Product
AFOLAN F 0.47-0.585 L/ha (0.19-0.23 L/ac) +
MCPA amine 1.1 L/ha (0.45 L/ac)

At 0.47-0.585 L/ha one 10 litre container treats 21.3-17.2 ha (52.6-42 ac).

Weeds controlled: Wild buckwheat, tartary buckwheat, green smartweed, cow cockle, hemp-nettle, corn spurry, chickweed, redroot pigweed, prostrate pigweed, Canada thistle top growth. All weeds controlled by 1.1 L/ha MCPA (0.45 L/ac).

Application:

1. Apply in 100 L of water per ha (40 L/ac).
2. Use the lower rates when growing conditions and rainfall are above average.
3. When using a flowable formulation certain precautions and sprayer adjustments must be made to ensure that it is applied correctly. Be sure that the sprayer is equipped with 50 mesh line strainers and screens. Stainless steel or hardened stainless steel nozzles are recommended. Also, pumps must be of sufficient capacity for adequate agitation through the by-pass or jet agitator which should terminate in the bottom of the tank.

Note: A jet agitator should never be put on the end of the by-pass line because a high back pressure develops on the pump and system when the booms are shut off.

Timing:

Apply when the weeds are in the 1-4 leaf stage. Hemp-nettle must be treated before the full 4-leaf stage.

Apply when the cereal crop is in the 2-4 leaf stage. **Application after the 4-leaf stage of cereals can result in severe crop damage especially on sandy soils under good moisture conditions.**

Mode of Action:

Linuron is a systemic herbicide which is absorbed through both the foliage and the root system of the plant. Once in the plant, its mode of action is to strongly inhibit photosynthesis. Outward appearance of affected plants is chlorosis (yellowing), stunting, and finally death which occurs in 10-14 days after treatment.

amine formulation. Refer to 2,4-D/MCPA section.

Precautions:

1. DO NOT use when crops are under drought stress.
2. DO NOT use on crops underseeded to forage crops.
3. DO NOT graze or feed green plants to livestock.
4. DO NOT re-treat field with a second application of linuron during the same crop year as injury to the crop may result.
5. DO NOT freeze liquid formulations.
6. DO NOT apply if rain is expected within one hour.

Mixing:

1. When mixing AFOLAN F with MCPA, the following is recommended:
   - (a) Fill sprayer half full with clean water.
   - (b) Shake the sealed Afolan F container vigorously.
   - (c) Slowly add Afolan F to sprayer tank while the bypass or jet agitator is operating.
   - (d) Empty the Afolan F container completely, letting it drain in a vertical position for 30 seconds.
   - (e) Add rinse water to the container until one quarter full, shake vigorously, and repour into tank. Repeat this procedure three times.
   - (f) Add MCPA.
   - (g) Fill tank to required water level and spray. Continuous agitation is required.

Note: DO NOT leave linuron in the spray tank overnight or vigorous agitation with a paddle will be required to resuspend the chemical.

Ally (metsulfuron methyl)* DuPont

Activity: 60% dry flowable

Registered Uses:

Crops	**Recommended Rate of Product**
Wheat (spring, durum), barley	7.5 g/ha

At 7.5 g/ha one 122 g container treats 15.2 ha (40 ac).

Weeds Controlled: Stinkweed, redroot pigweed, wild mustard, hemp-nettle, chickweed, volunteer canola, shepherd's-purse, tartary buckwheat, ball mustard, green smartweed, kochia, flixweed, cow cockle, lady's-thumb, bluebur, prostrate pigweed.

Weeds Suppressed: Lamb's-quarters, Canada thistle, sow-thistle (perennial, annual), wild buckwheat, Russian thistle.

Application:

1. Add the proper amount of Ally into the necessary volume of water in the spray tank with the agitator running. Prepare the mixture to use a minimum of 100 L/ha (40 L/ac) spray volume. Continuous agitation is required for a uniform suspension and application.
2. A recommended surfactant such as Agsurf, Triton XR, Super Spreader, Agral 90 or Citowett Plus must be used when applying Ally. Add surfactant as the last ingredient at the rate of 2 L per 1000 L of spray volume. Antifoaming agents may be needed.
3. Apply the spray mixture with ground equipment only, using a minimum of 100L/ha spray volume (40 L/ac). Use a properly calibrated sprayer that will ensure thorough coverage and a uniform spray pattern. Flat fan nozzles are recommended. Use 50 mesh screens or larger.

Timing:

1. Apply when wheat and barley are in the 2-leaf to flag-leaf stage. Do not apply past the boot stage. Best results are obtained when applied to small and actively growing weeds. Apply before crop canopy prevents thorough coverage of the weeds.
2. Apply to Canada thistle and sow-thistle when the majority of thistles have emerged and are actively growing. For best topgrowth control apply when thistles are no larger than 15 cm (6 in.) tall. Later emerging thistles will not be controlled.
3. Apply to wild buckwheat when in the cotyledon to 3-leaf stage and when lamb's-quarters or Russian thistle are no larger than 8 cm (3 in.) tall.

Mode Action:

ALLY rapidly inhibits the growth of susceptible weeds, however, typical symptoms (discoloration) or dying weeds may not be noticeable for 1 to 3 weeks after application depending upon growing conditions and weed susceptibility. Degree of control and duration of effect depends on weed sensitivity, weed size, growing conditions, soil pH and spray coverage.

Precautions:

1. **Some naturally occurring populations of certain weeds listed on this label will not be controlled by Ally, Glean or Refine. To delay selection of resistant populations use other herbicides for broadleaf weed control following the use of Glean, Ally or Refine. DO NOT use Ally, Glean, Muster, Triumph Plus or Refine repeatedly in the same field. Recommended tank mixtures of Ally and 2,4-D or MCPA will delay the selection of resistant populations of weeds that are normally controlled or suppressed by both herbicides (see tank-mix section of label).**

   For further information regarding weed resistance to herbicides refer to page 9.
2. The additive effect of soil residues from the use of Ally and Assert 300-LC herbicide on the same land has not been determined. Refer to "Soil Residual Herbicides" section for further detail.
3. Apply only on land having a soil pH of 7.9 or lower.
4. FOR CROP ROTATION FLEXIBILITY DO NOT USE ALLY ON ALL LAND IN WHEAT OR BARLEY PRODUCTION. Refer to product label or the following table for recropping guidelines.
5. Use spray preparation of Ally within 24 hours or product degradation may occur. If spray preparation is left standing without agitation, thoroughly agitate before spraying.
6. DO NOT apply or allow drift onto desirable plants or non-target land areas, cropland, water, irrigation or drainage ditches.
7. DO NOT apply to wheat or barley undersown with other crops as injury to other crops will occur.

8. DO NOT exceed a total of 7.5 g product/ha within a 12 month period.
9. DO NOT apply by aircraft.
10. Immediately after spraying, thoroughly clean all traces of Ally from application equipment to avoid possible injury to other crops.
    (a) Drain tank then flush tank, boom and hoses with clean water for a minimum of 10 minutes.
    (b) Fill tank with clean water, then add 1 litre household ammonia (containing a minimum 3% ammonia) per 100 litres of water (1% by volume). Flush through boom and hoses then allow to sit for 15 minutes with agitation; then drain. Note: DO NOT use chlorine bleach with ammonia.
    (c) Repeat step b.
    (d) Nozles and screens should be removed and cleaned separately. To remove traces of chlorine bleach rinse tank thoroughly with clean water and flush through hoses and boom.
11. DO NOT apply ALLY to a wheat or barley crop that is stressed by severe weather conditions, drought, low fertility, water saturated soil, disease or insect damage as crop injury may result. Drought, disease or insect damage following application also may result in crop injury.
12. Under certain conditions (such as heavy rainfall, prolonged cool weather, frost conditions, wide fluctuations in day/night temperatures) temporary lightening in crop colour and occasionally a slight reduction in height may occur.
13. Wherever ALLY is used on land previously treated with Glean read the rotational guidelines on both labels and follow the one with the longest interval stated for your situation.
14. SEE LABEL FOR DETAILED PRECAUTIONS AND FOLLOW ALL LABEL DIRECTIONS.

Mixing:

1. To increase the spectrum of broadleaf weeds controlled in **wheat** (spring, durum) and **barley** and to delay the selection of resistant weed populations, mix ALLY at 5-7.5 g/ha with any of the following:
    (a) 2,4-D amine at 0.84-1.1 L/ha (0.34-0.45 L/ac).
    (b) 2,4-D LV ester 600 at 0.7-0.9 L/ha (0.28-0.37 L/ac).
    (c) 2,4-D LV ester 700 at 0.6-0.8 L/ha (0.24-0.32 L/ac).
    (d) MCPA amine at 0.7-1.1 L/ha (0.28-0.45 L/ac).
    (e) MCPA ester at 0.7-1.1 L/ha (0.28-0.45 L/ac).

    Add a recommended surfactant at the rate of 2 L per 1000 L of spray volume. Apply the tank-mix from the full 3-leaf stage to just before the flag-leaf stage. Ensure that Ally is completely in suspension in the spray tank before adding 2,4-D or MCPA. On repeat tank loads, prepare an Ally/water slurry and add it to the required water volume in the spray tank prior to adding 2,4-D or MCPA. Use the higher rate of Ally for control of bluebur, lady's-thumb, prostate pigweed and tartary buckwheat.
2. Mix ALLY at 7.5 g/ha with AVENGE 200-C at 4.25 L/ha (1.7 L/ac) to control wild oats and broadleaf weeds in **barley** and those varieities of **wheat** registered for Avenge 200-C. Do not use this tank-mix during periods of stress (i.e. dry conditions, low humidity or when plants are not actively growing) since applications under these conditions may result in significantly reduced wild oat control. Ensure that Ally is completely in suspension in the spray tank before adding Avenge 200-C. DO NOT ADD A SURFACTANT. On repeat tank loads, prepare an Ally/water slurry and add it to the required water volume in the spray tank prior to adding Avenge.

The following recropping and rotation intervals should be observed after using Ally unless a successful field bioassay has been completed. The minimum recropping or rotation interval is from the time of last application to the anticipated date of planting.

Crop to be Planted	**Soil pH**	**Minimum Crop Rotation Interval (Months)**	
		Black & Grey-Wooded Soils	Brown & Dark Brown Soils
Wheat (spring, durum), barley	7.9 or lower	10	10
Oats	6.9 or lower	10	10
	7.0-7.9	10	22
Canola	6.9 or lower	10	22
	7.0-7.9	22	34
Flax	6.9 or lower	10	22
	7.0-7.9	34	34
Lentil	6.9 or lower	34	34
	7.0-7.9	48	48
Alfalfa, red clover, peas	7.5 or lower	22	FIELD BIOASSAY
Fescue	7.5 or lower	10	FIELD BIOASSAY
All other crops	7.9 or lower	FIELD BIOASSAY	FIELD BIOASSAY

IMPORTANT — Land previously treated with ALLY cannot be rotated to crops other than those listed until a field bioassay confirms that residues of ALLY are not present. A field bioassay involves growing teststrips of the crop(s) intended for production the following year in fields previously treated with Ally. Crop response will indicate whether or not to rotate to the crop(s) used in the test strip. See Field Bioassay section of the label. Failure to follow these instructions could result in injury to subsequent crops.

Note: If rainfall is less than 130 mm (5 in.) in the brown or dark brown soil zones or 250 mm (10 in.) in the black or grey-wooded soil zones in any year within a stated interval prior to planting a broadleaf crop; extend the rotational interval 12 months.

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*This product has a temporary registration. Additional technical information is required in relation to its use. Be advised that the current label may be revised. Directions for use and cautionary statements should be carefully followed.

Assert 300-LC/Assert 300-SC (imazamethabenz)* **Cyanamid**

Activity: 300 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates of Product**
Wheat (spring, durum), barley	1.3 - 1.6 L/ha (0.53 - 0.65 L/ac)

At 1.3 - 1.6 L/ha one 10.8 litre container treats 8.0 - 6.5 ha (20-16 ac).

Weeds Controlled: Wild oats, wild mustard, stinkweed and suppression of wild buckwheat and tartary buckwheat.

Application:

1. For ground application only, apply in 100 L of water/ha (40 L/ac). Flat fan spray tips are recommended over cone tips. Pressure at nozzle tips should be 275 kPa (40 psi). Lower pressures may result in poor control. Tilt spray boom forward 45 degrees if flat fan nozzle tips are used. Use a 50 or 60 mesh stainless screen element in the main "line strainer" unit. Use a 50 mesh screen or nozzle strainers when applying 100 litres of solution per hectare. Wash sprayer thoroughly after spraying has been completed.
2. Apply 1.3 L/ha (0.53 L/ac) of product if the majority of wild oats are in the 1-3 leaf stage.
3. Use 1.6 L/ha (0.65 L/ac) of product if wild oats are in the 4-leaf stage.
4. **Note:** When using Assert 300-SC the addition of ACIDULATE Spray Water pH Adjuster is required. Add 1 package of Acidulate per jug of Assert 300-SC to the spray tank (3/4 full with water) before adding Assert 300-SC.

Timing:

Apply when the majority of wild oats are in the 1-4 leaf stage of growth, wild mustard and stinkweed are in the cotyledon to 7-leaf stage, and wild buckwheat and tartary buckwheat are in the cotyledon to 4-leaf stage.

Mode of Action:

Assert is absorbed through the foliage and roots of wild oat plants and susceptible weeds. Susceptible plants stop growing soon after spray application. Obvious signs of plant death may not be seen in some plants until 2 weeks later but the competitive effect of these plants will have been removed.

Precautions:

1. **Recropping:** Rotation to the following crops can be made the year following application of Assert:
   - Black and grey wooded soil zones: Spring wheat, durum wheat, barley, sunflower and canola.
   - Brown and dark brown soil zones: Spring wheat, durum wheat, barley and sunflower.

   Two years after the application of Assert the following crops can be grown in all soil zones: spring wheat, durum wheat, barley, sunflower, peas, canola, flax, oats, canary grass.

   To assess potential damage to crops not listed above, conduct a field bioassay (a test strip grown to maturity) the year before planting any crop. Lentil have been observed to be particularly sensitive to Assert residues in the soil.

   Note: The recropping recommendations given above are for Assert 300-LC. At the time of printing the recropping recommendations for Assert 300-SC were under review. Refer to the product label for recropping details.

   The additive effect of soil residues from the use of Assert and Ally or Glean herbicides on the same land has not been determined. Refer to "Soil Residual Herbicides" section for further details.
2. Assert may cause initial yellowing and temporary stunting on durum wheat but the crop will recover under normal growing conditions and yield will not be affected.
3. DO NOT make more than one application per growing season.
4. DO NOT apply to the same field in two successive years.
5. DO NOT spray if rain is predicted within 3 hours.
6. DO NOT spray when freezing temperatures are forecast.
7. DO NOT graze treated fields or cut treated forage for silage or hay.
8. DO NOT apply to wheat and barley undersown with other crops as injury to other crops may occur.
9. DO NOT apply by aircraft.

Mixing:

1. To control wild oats and additional broadleaf weeds in **wheat** and **barley**, ASSERT may be tank-mixed with the following:
   (a) 2,4-D LV ester (700 g active ingredient/ litre) at up to 0.8 L/ha (0.32 L/ac), or
   (b) MCPA ester at up to 1.12 L/ha (0.45 L/ac)

   In the black and grey wooded soil zones tank-mix Assert at 1.6 L/ha (0.65 L/ac); for the brown and dark brown soil zones tank-mix Assert at 1.3 L/ha (0.53 L/ac) if the majority of wild oats are in the 1-3 leaf stage or 1.6 L/ha (0.65 L/ac) if the wild oats are in the 4-leaf stage.

   Tank mixes containing either 2,4-D ester or MCPA ester can be applied only after the crop has reached the 4-leaf stage. DO NOT mix ASSERT with either 2,4-D amine or MCPA amine. Apply the tank-mix combination at the volume of 100 litres spray per hectare (40L/ac).

   When mixing with a broadleaf herbicide, fill tank one-half to three-quarters full with clean water and start agitating. Add the broadleaf herbicide first to the partially filled tank while agitating. Add ASSERT herbicide when tank is three-quarters filled while agitating. Fill tank and agitate, or recycle for at least five minutes before spraying. Continue agitation until spraying is completed.

*This product has a temporary registration. Additional technical information is required in relation to its use. Be advised that the current label may be revised. Directions for use and cautionary statements should be carefully followed.

Activity: 400 g active ingredient/litre
10% Granules

Registered Uses:

	Recommended Rates of Product			
Crops	**Spring Granular**	**Spring Liquid**	**Fall Granular**	**Fall Liquid**
Wheat (spring, durum)				
before seeding	11-14 kg/ha (4.5-5.7 kg/ac)	3.0-3.5 L/ha (1.2-1.4 L/ac)	11-17 kg/ha (4.5-6.9 kg/ac)	3.0-4.25 L/ha[5] (1.2-1.7 L/ac)
after seeding	14-17 kg/ha (5.7-6.9 kg/ac)	3.5-4.25 L/ha (1.4-1.7 L/ac)	— —	— —
Barley	14-17 kg/ha (5.7-6.9 kg/ac)	3.5-4.25 L/ha (1.4-1.7 L/ac)	11-17 kg/ha (4.5-6.9 kg/ac)	3.0-4.25 L/ha[5] (1.2-1.7 L/ac)
Canola, Flax and Mustard	17-22 kg/ha (6.9-8.9 kg/ac)	4.25-5.5 L/ha (1.7-2.2 L/ac)	14-22 kg/ha[4] (5.7-8.9 kg/ac)	3.5-5.5 L/ha[6] (1.4-2.2 L/ac)
Peas	Not Recommended	4.25 L/ha (1.7 L/ac)	- Not Recommended -	

DO NOT APPLY this product before seeding wheat in soils with 4% or less organic matter (brown, dark brown or grey-wooded soil zones) where discers are to be used for the seeding operation. If an air seeder is to be used, it must be equipped with a depth control device to ensure accurate seed placement, otherwise crop injury may occur.

Where a rate range is shown, use the lower rate on soils with 4% or less organic matter and the higher rate on soils with greater than 4% organic matter.

Use 11 kg/ha (4.5 kg/ac) on soils with less than 2% organic matter, 14 kg/ha (5.7 kg/ac) on soils with 2-4% organic matter and 17 kg/ha (6.9 kg/ac) on soils with greater than 4% organic matter.

[4] Use 14 kg/ha (5.7 kg/ac) on soils with less than 2% organic matter, 17 kg/ha (6.9 kg/ac) on soils with 2-4% organic matter and 22 kg/ha (8.9 kg/ac) on soils with greater than 4% organic matter.

[5] Use 3.0 L/ha (1.2 L/ac) on soils with less than 2% organic matter, 3.5 L/ha (1.4 L/ac) on soils with 2-4% organic matter and 4.25 L/ha (1.7 L/ac) on soils with greater than 4% organic matter.

[6] Use 3.5 L/ha (1.4 L/ac) on soils with less than 2% organic matter, 4.25 L/ha (1.7 L/ac) on soils with 2-4% organic matter and 5.5 L/ha (2.2 L/ac) on soils with greater than 4% organic matter.

At 3.5-4.25 L/ha one 22.7 litre container treats 6.5-5.3 ha (16.2-13.2 ac). At 14-17 kg/ha one 22.7 kg bag treats 1.62-1.34 ha (4.0-3.3 ac).

Underseeding: Forage legumes such as alfalfa, trefoil and clovers may be seeded with labelled crops treated with Avadex BW herbicide provided the legumes are not harvested for green crop, silage or hay in the year of seeding.

Weeds controlled: Wild oats.

Formulations:

Liquid Formulation - Use on soils that are free of trash. Incorporate as soon as possible on the day of spraying, preferably immediately. On hot windy days, large losses can result from delayed incorporation. Apply in 100 L of water/ha (40 L/ac) at 200 kPa (30 psi).

Granular Formulation - Use on all soils including those carrying heavy trash cover. Granular Avadex BW is especially well suited to fall application.

Application:

Spring - Use before seeding canola, mustard, peas or flax. Use before or after seeding barley or wheat. DO NOT APPLY this product before seeding wheat in soils with 4% or less organic matter (brown, dark brown or grey-wooded soil zones) where discers are to be used for the seeding operation. If an air seeder is to be used, it must be equipped with a depth control device

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to ensure accurate seed placement, otherwise crop injury may occur. Incorporate immediately according to directions.

Fall - Apply after September 15 and before freeze-up and incorporate. **Note:** In long open falls, early application prior to October 1 may lead to excessive Avadex BW losses and a reduction in wild oat control. Till the following spring at depths no greater than 6 cm (2.5 in.) to avoid dilution of the chemical which could result in reduced wild oat control and possible injury to sensitive crops such as wheat and barley. The margin of crop safety is not as great when wheat is seeded into soil which has been fall treated with Avadex BW as when the chemical is applied after seeding in the spring since it is extremely difficult to accurately place the seed below the fall treated layer of soil. This is especially true on heavy clay soils. When seeding wheat into fall treated soils, very careful attention must be paid to placing the seed at a uniform depth of 6-7.5 cm (2.5-3 in.). Placement of the seed into treated soil will result in stand reductions and delayed maturity.

Incorporation

A. Spring

Applied after seeding - Avadex BW applied after seeding wheat or barley should be incorporated with a double harrowing at right angles. This is the preferred method for use with wheat where drills are used. The double harrowing may dry out the soil sufficiently to inactivate the herbicide. A light rain within 2-3 weeks of application is then required for re-activation.

Applied at seeding - Avadex BW can be applied at seeding by mounting a spray boom or granular applicator behind a discer and applying the herbicide during the seeding operation. With proper adjustments, this provides excellent wild oat control, crop safety and minimum disturbance and drying of the soil. This is the preferred treatment for barley and wheat in areas where discer seeders are used. Fields should be harrowed after seeding to ensure adequate mixing of the chemical in the soil.

Applied before seeding - The most satisfactory incorporation is with a disc-type implement set to cut 6 cm (2.5 in.) deep followed by harrowing at right angles. Cultivators do not give as satisfactory incorporation and may result in wild oat misses. If a cultivator is used, a vibrashank type is preferred. It should be set to cut 6 cm (2.5 in.) deep followed by a harrowing at right angles. A double harrowing at right angles will also give satisfactory incorporation provided the soil is loose and free of trash cover allowing the harrows to penetrate.

B. Fall

When applied in the fall Avadex BW requires incorporation to hold the chemical in position and reduce overwintering losses to a minimum. It is possible, however, to delay a part of the incorporation procedures until spring. This is especially true when using the granular formulation.

In **stubble**, the use of the granular formulation is recommended since trash cover must be destroyed prior to using the liquid formulation. Hard or lumpy ground should be disced once prior to application to ensure proper mixing of the granules. The most satisfactory incorporation is with a disc-type implement set to cut 6 cm (2.5 in.) deep followed by a harrowing at right angles. Cultivators do not give as satisfactory incorporation and may result in wild oat misses. If a cultivator is used, a vibrashank type is preferred. It should be set to cut 6 cm (2.5 in.) deep and followed by a harrowing at right angles. In both cases (disc or cultivator incorporation) the second incorporation can be delayed until spring. If a deeper working of the field is desired, this deeper working should be carried out in the fall before Avadex BW is applied.

On **summerfallow**, incorporation should be accomplished with a disc followed by a harrowing at right angles, a vibrashank cultivator followed by a harrowing at right angles or double harrowing. The second operation can be delayed until spring.

If summerfallow must be ridged in the fall to prevent soil erosion the granular formulation should not be used in the fall. If soil must be ridged after incorporating liquid Avadex BW the depth of the ridging should be kept to a minimum as deep ridging may decrease the wild oat control or cause crop injury. On fields where erosion is a threat, spring application or the use of a post emergent product is preferred over fall treatment with Avadex BW.

Seeding Depth:

Canola, mustard, peas and flax have good tolerance to Avadex BW and can be planted into the treated layer at normal depth for these crops. Since barley and wheat are more sensitive, they should be planted 6-7.5 cm (2.5-3 in.) deep to reduce the chance of crop injury. It is especially important that wheat seed be below the treated layer of soil.

General:

Some wild oat seedlings may emerge before being killed. As growth ceases, the leaves become brittle and bluish green in color.

Seedlings that germinate in treated soil are killed quite rapidly. Seedlings that germinate below the treated layer are killed more slowly and the amount of growth prior to death increases as the depth of the seed increases. A seedling emerging from a depth of 15 cm (6 in.) may reach a height of more than 5 cm (2 in.) before it dies. On the other hand, wild oat plants that reach the two-leaf stage before the Avadex BW is activated by sufficient moisture may still be controlled.

Under normal conditions, Avadex BW will not leave a harmful residue in the soil to affect following crops. Under dry conditions, however, some Avadex BW may carry over. Therefore, oats should not be sown the year following application of Avadex BW.

Precautions:

1. The liquid formulation should be protected from freezing. If it does freeze it can be reconstituted by warming to 20 C and agitating.
2. Fall application is not recommended on soils where a lack of trash cover combined with the required operation could result in soil erosion.
3. For all Avadex BW treatments, wheat and barley must be seeded below the treated layer at a uniform depth of 6-7.5 cm (2.5-3 in.). DO NOT seed deeper than 7.5 cm (3 in.).
4. The margin of safety is not as great when wheat is seeded into soil which has been fall treated with Avadex BW as when the chemical is applied after seeding in the spring since it is extremely difficult to accurately place the seed below the treated layer of soil. This is especially true on heavy clay soils. Seed placement at the bottom of the cut of the disc can be improved by lengthening the tubes through which the seed falls, thus reducing the free fall distance of the seed. When seeding wheat into fall treated soils, very careful attention must be paid to placing the seed at a uniform depth of 6-7.5 cm (2.5-3 in.). Placement of the seed into treated soil will result in stand reductions and delayed maturity.
5. There are no grazing restrictions for crops other than forage legumes.
6. Rainfall or moisture is necessary for activation. Rainfall before incorporation may increase the loss of Avadex to the atmosphere.

Mixing:

1. Mix AVADEX BW (liquid formulation) at rates recommended for use in **wheat** or **barley** with:
   (a) TREFLAN (liquid formulation) at 1.1 L/ha (0.45 L/ac) on light soils and 1.5 L/ha (0.6 L/ac) on medium to heavy soils or;
   (b) RIVAL (liquid formulation) at 1.2 L/ha (0.5 L/ac) on light soils and 1.6 L/ha (0.65 L/ac) on medium to heavy soils; for control of wild oats and green foxtail (wild millet). Use only on fields 70% free of trash. Apply in 100 L of water/ha (40 L/ac) after seeding and incorporate with a double harrowing at right angles. Seed should be placed 5-7.5 cm (2-3 in.) deep.
2. Avadex BW liquid may be applied in combination with dry urea fertilizer or dry mixed fertilizers (not ammonium nitrate) in either spring or fall. A minimum of 150 kg/ha (60 kg/ac) of dry fertilizer must be used to ensure uniform distribution of the herbicide. Sufficient Avadex BW must be blended with the fertilizer (using commercial fertilizer blending equipment only) to give the correct rate of chemical for the fertilizer rate being used to a maximum of 4.25 L/ha (1.7 L/ac). Spread the fertilizer as soon as possible after blending with a properly calibrated and adjusted spreader. Spin spreaders should be calibrated to apply 1/2 the desired rate per hectare and application overlapped by doubling back to cover 1/2 of the previous swath. Dribble spreaders must be calibrated with the fertilizer chemical mixture since the flow pattern will be slower than for straight dry urea. Incorporate immediately after spreading using normal Avadex BW procedures. Only pre-plant incorporated applications are recommended in the spring. For best results with spring pre-plant applications, delay the second incorporation for at least 24 hours.
3. To apply Avadex BW in conjunction with fall fertilizer banding a granular applicator may be mounted such that Avadex granules are broadcast prior to the first row of openers or shanks of the banding unit.

   The banding openers/shanks alone may be used for incorporation or may be followed by tine harrows as required for trash management. To obtain maximum performance with Avadex BW, follow Avadex BW banding guidelines. Note: There must be adequate soil mixing to cover the granules.

Avenge 200-C, Avenge 280-C, Avenge 640-SP (difenzoquat) Cyanamid

Activity: Avenge 200-C 200 g active ingredient/litre
Avenge 280-C 280 g active ingredient/litre
Avenge 640 64% water soluble powder

Registered Uses:

Crops	**Recommended Rates of Product**		
	Avenge 200-C	**Avenge 280-C**	**Avenge 640**
Barley Wheat (Benito, Canuck, Chester, Columbus, Conway, Fielder, Glenlea, HY320, HY 355, Katepwa, Kenyon, Lancer, Leader, Macoun, Neepawa, Oslo, Selkirk) Winter wheat (Norstar, Sundance) Triticale (Welsh, Carman) Fall Rye (Cougar, Puma, Frontier, Kodiak) Canary seed	3.5-4.25 L/ha (1.4-1.7 L/ac)	2.5-3.0 L/ha (1.0-1.2 L/ac)	1.1-1.3 kg/ha (0.45-0.53 kg/ac)

At 3.5-4.25 L/ha one 20 litre container treats 5.7-4.7 ha (14.1-11.6 ac).
At 2.5-3.0 L/ha one 10 litre container treats 4.0-3.3 ha (10-8.3 ac).
At 1.1-1.3 kg/ha one 8.85 kg container treats 8.0-6.8 ha (20-17 ac).

Underseeding:
Forage crops: Alfalfa, sweet clover, red clover, bird's-foot trefoil, creeping red fescue, meadow fescue, bromegrass, timothy, crested wheatgrass, orchardgrass, Russian wild ryegrass, reed canarygrass, Kentucky bluegrass may be seeded with wheat or barley and treated with Avenge alone, provided the forages are not to be grazed or harvested for feed during the year of seeding.

Weeds controlled: Wild oats.

Application:

1. Use the higher rate when the wild oat density exceeds 200 per square metre. Apply the lower rate when the wild oat density is between 1-200 plants per square metre. For best results apply when the crop and wild oats are growing vigorously.
2. For ground application apply in 100 L of water/ha (40 L/ac). Use flat fan spray tips. Pressure at the nozzle tips should be 275 kPa (40 psi). Tilt spray boom forward 45 0. Use 50 or 60 mesh stainless screen element in the main line strainer unit. Use a 50 mesh screen on nozzle strainers when applying 100 L of solution/ha.
3. For aircraft application apply in 20-50 L of water/ha (8-20 L/ac).
4. When using Avenge 640 a surfactant must be added. Add Agral 90 or Agsurf at 0.6 L/ha (0.24 L/ac) or 0.6% by volume. Fill the tank 3/4 full with clean water than add required quantity of Avenge 640 and surfactant. Add additional water required. Circulate the spray mixture in the tank for 5 minutes before spraying begins to ensure thorough mixing.
5. Avenge herbicide may cause foaming in certain types of water. If this occurs agitation should be kept to a minimum and a silicone anti-foaming agent added (e.g. HALT).

Timing:

1. Apply when the majority of the wild oats are in the 3-4 leaf stage to minimize early wild oat competition and provide maximum yield increases. Avenge applied at the 4-5 leaf stage may give better control of wild oats but yield increases may be reduced due to the competition which occurs prior to control. Avenge will not control wild oat plants that are in the 1-2 leaf stage.
2. Apply before the 6-leaf stage of barley, wheat (spring, durum) and canary seed.

Mode of Action:

1. The activity of Avenge is primarily through contact action. Therefore, good spray coverage is essential.
2. Under cool weather conditions or under high humidity the crop may show some initial burning on lower leaves, however, there generally will be no adverse effects on crop maturity or yield.
3. Avenge controls wild oats by stopping their growth. Obvious signs of plant death may not be seen for 3 to 4 weeks but the competitive effect of these plants will have been removed.

Precautions:

1. DO NOT hold spray solutions in galvanized tanks for more than 24 hours.
2. Wash sprayer out thoroughly with water after spraying.
3. DO NOT apply when plants are wet with dew or rain.
4. DO NOT apply if rain is forecast within six hours.
5. DO NOT apply if frost is forecast the same evening.
6. DO NOT graze treated cereal crops within 8 weeks of application. Straw from treated fields can be fed to livestock. DO NOT apply Avenge to wheat and barley companion crops and underseeded forages if the forages are to be grazed or harvested for feed during the year of seeding.
7. DO NOT apply if the crop is under extreme drought stress or is showing effects of excessive moisture (poor drainage).
8. Use ONLY on the crop varieties listed. Use on unregistered crop varieties could result in injury, delay in maturity and loss of yield.
9. DO NOT make more than one application per growing season.

Mixing:

1. To control wild oats and broadleaf weeds in barley, canary seed and listed varieties of wheat AVENGE 200-C or AVENGE 280-C or AVENGE 640 may be tank-mixed with any of the following.
   (a) BUCTRIL-M at 1.0 L/ha (0.4 L/ac).
   (b) ESTAPROP or DIPHENOPROP 600 at 1.75 L/ha (0.71 L/ac). Wheat and barley only.
   (c) PARDNER at 1.0-1.2 L/ha (0.4-0.5 L/ac) (DO NOT apply by aircraft).
   (d) MCPA ester at 1.1 L/ha (0.45 L/ac)
   (e) 2,4-D LV ester (600 g active ingredient/litre) at 0.70-0.90 L/ha (0.28-0.38 L/ac). DO NOT apply to canary seed.
   (f) 2,4-DB (Embutox E, Butyric 400 or Cobutox) at recommended rates. DO NOT apply to canary seed.

   Apply AVENGE and broadleaf herbicide tank mixes in 100 L of water/ha (40 L/ac) when the wild oats are in the 3-5 leaf stage. DO NOT apply tank-mix combinations under stress conditions. Fill tank 1/2 - 3/4 full with clean water and start agitating. Add the broadleaf herbicide first to the partially filled tank. Add AVENGE when tank is 3/4 filled. Fill tank and continue agitation until spraying is completed.
2. Mix AVENGE 200-C at 4.25 L/ha (1.70 L/ac) or AVENGE 280-C at 3.0 L/ha (1.2 L/ac) with (a) GLEAN at 15 g/ha (soils with a pH of 7.5 or lower), (b) ALLY at 7.5 g/ha (soils with a pH of 7.9 or lower), or (c) REFINE at 20 g/ha (8 g/ac) to control wild oats and broadleaf weeds in **barley** and the listed varieties of **wheat**. Precisely follow all use directions regarding crop rotation on the broadleaf herbicide label. DO NOT apply the tank-mix to canary seed. DO NOT use this tank-mix during periods of stress (ie: dry conditions, low humidity or when plants are not actively growing) since applications under these conditions may result in significantly reduced wild oat control. DO NOT apply the tank-mix by aircraft. Note: Ensure the broadleaf herbicide is in suspension before adding AVENGE; if AVENGE is added first, then the broadleaf herbicide must be pre-slurried before it is added. On repeat tank-loads, if any tank-mix spray solution remains in the tank, prepare a broadleaf herbicide/water slurry and add it to the required water volume in the spray tank prior to adding Avenge. DO NOT add a surfactant when tank-mixing Avenge 200-C or 280-C with Glean, Ally or Refine. Add Agral 90 or Ag Surf at 0.6% by volume when tank-mixing Avenge 640.
3. DO NOT tank-mix AVENGE herbicide with or spray within 5 days prior to or following the application of AVENGE any formulation containing MCPA amine, 2,4-D amine, BANVEL, TARGET, LEXONE, BLAGAL, SENCOR, LEXONE, LOROX, AFOLAN, STAMPEDE 360, STAMPEDE CM, or mixtures containing these products.

   For any broadleaf weed herbicide registered for tank-mixing with AVENGE, if applied separately no waiting interval is required between its application and the application of AVENGE.
4. DO NOT mix AVENGE with ANY broadleaf herbicide, except 2,4-DB only (alfalfa, red clover and bird's-foot trefoil), for use on underseeded forages.

Banvel Herbicide (dicamba) — Sandoz

Activity: 480 g active ingredient/litre

Registered Uses:		**Recommended Rates of Product**	
Crops	**Banvel**	**Banvel + 2,4-D**	**Banvel + MCPA**
Wheat (spring, durum, winter), oats, spring rye	230-290 mL/ha (90-120 mL/ac)	230-290 mL/ha + 850 mL/ha (90-120 mL/ac + 340 mL/ac) Not Recommended on Oats	230-290 mL/ha + 850 mL/ha (90-120 mL/ac + 340 mL/ac) Not Recommended on Spring Rye
Barley	230 mL/ha (90 mL/ac)	230 mL/ha + 850 mL/ha (90 mL/ac + 340 mL/ac)	230 mL/ha + 850 mL/ha (90 mL/ac + 340 mL/ac)
Canary Seed	290 mL/ha (120 mL/ac)	Not Recommended	290 mL/ha + 850 mL/ha (120 mL/ac + 340 mL/ac)

At 230-290 mL/ha one 9.5 litre container treats 41.3-32.8 ha (102-80.9 ac).
At 230-290 mL/ha one 5.0 litre container treats 21.7-17.2 ha (54-43 ac).

Weeds controlled by Banvel + 2,4-D or MCPA tank mixes: Bluebur, tartary buckwheat, wild buckwheat, burdock, field bindweed top growth, cleavers, cow cockle, cocklebur, flixweed, lamb's-quarters, ball mustard, dog mustard, hare's-ear mustard, Indian mustard, tumble mustard, wild mustard, wormseed mustard, prostrate pigweed, redroot pigweed, Russian pigweed, wild radish, common ragweed, false ragweed, giant ragweed, Russian thistle, shepherd's-purse, annual smartweed species, lady's-thumb, annual sow-thistle, perennial sow-thistle top growth, stinkweed, Canada thistle top growth, corn spurry, tame buckwheat, kochia, volunteer sunflower.

These rates are for the amine formulations of 2,4-D & MCPA (500 g active ingredient/litre). For rates of other 2,4-D & MCPA formulations see conversion factors in the 2,4-D/MCPA section.

Application:

Use at least 100 L of water/ha (40 L/ac) to reduce the risk of crop injury. Use the low recommended rate of product for application by aircraft.

Timing:

1. Although registered for application to the 2-5 leaf stage of wheat, oats and barley, in Saskatchewan it is recommended to spray at the 3-4 leaf stage of wheat and oats and the 3-leaf stage of barley. Treatment at the 3-leaf stage of the crop will usually combine maximum crop tolerance and weed susceptibility. In winter wheat apply in spring when crop is 15-25 cm (6-10 in.) tall, before the shot blade stage. In canary seed apply when crop is at the 3-5 leaf stage. In spring rye apply when crop is at the 2-3 leaf stage.
2. Application at higher rates or after the 4-leaf stage or at low water volumes will usually result in stem bending and delayed maturity. Under conditions conducive to prolific tillering the yield may also be reduced. Use the lower rate of application at the 5-leaf stage.

Very severe yield losses due to sterility will result from treatment during the flag leaf stage to the early heading stage.

Mode of Action:

Banvel is a translocated herbicide which affects the roots of the plant. It is slower acting than most other broadleaf herbicides and death of the plants may take 2-3 weeks.

Precautions:

1. DO NOT use on cereals or grasses underseeded to legumes.
2. DO NOT apply if rainfall is expected within 4 hours.
3. If treated vegetation has been consumed by meat animals within 30 days of application, feed the animals with untreated diet for 30 days before slaughter.
4. DO NOT graze or harvest cereal crops for livestock feed prior to crop maturity.

Sprayer Clean-up:

Banvel alone or Banvel plus 2,4-D or MCPA;

1. Hose down thoroughly the inside as well as outside surfaces of equipment while filling the spray tank half full of water. Flush by operating sprayer until the system is purged of the rinse water.

2. Fill tank with water while adding one litre of household ammonia for every 100 litres of water. Operate the spray pump to circulate the ammonia solution through the sprayer system for 15 to 20 minutes and discharge a small amount of the ammonia solution through the spray boom and nozzles. Let the solution out of the spray tank through the boom.
3. Remove the nozzles and screens and flush the system with two tank fulls of water.

Banvel plus other herbicides (ie: wettable powders, emulsifiable concentrates or other types of water dispersible formulations);

1. Complete, step 1 from above.
2. Fill tank with water while adding 1.0 kg of detergent for every 150 litres of water. Operate the pump to circulate the detergent solution through the sprayer system for 5-10 minutes and discharge a small amount of the solution through the boom and nozzles. Let the solution stand for several hours, preferably overnight.
3. Flush the detergent solution out of the spray tank through the boom.
4. Repeat step 1 and following with steps 2 and 3.

Mixing:

1. Mix BANVEL at rates recommended for use in wheat, oats, canary seed and barley with:
   (a) MCPA amine at 0.85 L/ha (0.34 L/ac) or;
   (b) MCPA POTASSIUM SALT at 0.7-1.1 L/ha (0.28-0.45 L/ac). For canary seed use MCPA amine only.
2. Mix BANVEL at rates recommended for use in wheat, spring rye and barley with 2,4-D amine at 0.85 L/ha (0.34 L/ac).
3. Mix BANVEL HERBICIDE at 230 mL/ha (90 mL/ac) with:

   SENCOR 500 at 275-425 mL/ha (110-170 mL/ac) or LEXONE DF at 275 g/ha (110 g/ac) on barley and wheat at the 2-3 leaf stage.

   DO NOT apply to Klondike, Johnston or Leduc barley. Allow a 4-5 day interval between the use of these mixtures and the application of a wild oat herbicide.
4. Allow a 4-7 day interval between the use of these tank mixes and the application of a wild oat herbicide. Length of interval depends on wild oat herbicide selected.

Basagran (bentazon) BASF

Activity: 480 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates of Product
Peas, fababeans, flax, dry beans (kidney, pinto, white), seedling forages grown for seed only (bromegrass, creeping red fescue, meadow foxtail, orchardgrass, timothy, crested wheatgrass, alfalfa, red clover, alsike clover, sainfoin)	1.75-2.25 L/ha (0.7-0.9 L/ac)

At 1.75-2.25 L/ha one 2 x 7 litre box treats 8.0-6.2 ha (20-15.5 ac).

Weeds controlled: Wild mustard, stinkweed, shepherd's-purse, common ragweed, giant ragweed, lady's-thumb, smartweed, redroot pigweed, lamb's-quarters, cocklebur, purslane, corn spurry, common groundsel, common chickweed when sprayed in the seedling stage. For top growth control of Canada thistle a repeat application 7-10 days after the first application is required.

Application:

1. Apply post-emergence in 100 L of water/ha (40 L/ac) at 275-425 kPa (40-60 psi) with flat fan nozzles tilted 45 degrees forward.
2. Use the higher rate for pigweed, lamb's-quarters, and Russian thistle or when lady's-thumb, smartweed and cocklebur are advanced.
3. The addition of Assist Oil Concentrate at 1-2% of total spray mixture will improve the control of advanced weeds and can be used in all crops.
4. Best results are obtained when Basagran is applied under high temperature conditions when weeds are actively growing.

Note: Slight leaf-yellowing, bronzing, speckling or burning may occur if the crop has been stressed by drought, flooding, hail or previous herbicide damage, or widely fluctuating temperatures.

Timing:

1. Apply after peas have 3 pairs of leaves.
2. Apply soon after fababeans are 10 cm (4 in.) tall.
3. Apply soon after flax is 5 cm (2 in.) tall.
4. Apply to dry beans between 1 to 3 trifoliate leaves.
5. Apply at the 2-5 leaf stage of seedling forage grasses.
6. Apply at the 1-5 trifoliate leaf stage of seedling forage legumes.

Mode of Action:

Basagran is a contact herbicide so for best results weed leaf surfaces must be thoroughly covered by the spray.

Precautions:

1. DO NOT apply if rainfall is expected within 6 hours.
2. If Basagran is frozen, warm to room temperature and shake well.
3. There are no grazing or feed restrictions.
4. Under hot, humid conditions restrict the Assist Oil Concentrate to a rate of 1.0% of total spray mixture.
5. Only one application per season is recommended for seedling forages. Crop injury may occur under hot, humid conditions.

Mixing:

1. (a) Clean spray tank and fill half full with clean water. Start agitation or by-pass system.
    (b) Add correct amount of Basagran and agitate 3 minutes.
    (c) Add correct amount of Assist Oil Concentrate and agitate 3 minutes.
    (d) Add remainder of water, agitate and spray.
    (e) If an oil film starts to build up in the tank, drain and clean tank with a strong detergent solution.
2. DO NOT tank-mix Basagran with other pesticides, fertilizers or spray adjuvants.

Activity: 480 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rate of Product**
Triazine tolerant canola	3.0 L/ha (1.2 L/ac)

At 3.0 L/ha one 10 litre container treats 3.3 ha (8.2 ac).

NOTE: Use Bladex only on triazine tolerant canola varieties OAC Triton or Tribute seed. Non-triazine tolerant canola will be killed by Bladex.

Weeds controlled: Wild mustard, stinkweed, wild buckwheat, redroot pigweed, (seedling to 5 cm (2 in.) high), chickweed, lamb's-quarters, hemp-nettle, cleavers, green smartweed, lady's-thumb, common groundsel, shepherd's-purse, volunteer canola (non-triazine tolerant), volunteer flax.

Application:

Apply in 100 L of water/ha (40 L/ac) at a pressure of 275 kPa (40 psi). Use 50 mesh or larger in-line and nozzle screens. The use of flat fan spray nozzles is recommended to improve coverage. Do not use flood jet or hollow cone nozzles. The sprayer should be equipped with an agitation system sufficient to ensure thorough and constant mixing.

Timing:

Apply when the crop and weeds are in the 1-4 leaf stage. Optimum weed control is achieved when the weeds are small and actively growing; later applications will be less effective.

Mode of Action:

Cyanazine inhibits photosynthesis in susceptible weed species. Evidence of control should be clearly visible within 7 days of application.

Precautions:

1. DO NOT apply if rainfall is expected within 2 hours.
2. DO NOT allow the spray mixture to stand in the spray tank without agitation.
3. Thoroughly clean the sprayer before and after use to prevent damage to susceptible crops.
4. DO NOT overlap spray swaths.

Mixing:

1. Mix BLADEX at the recommended rate with POAST at the recommended rates for control of broadleaf and grassy weeds in **triazine tolerant canola**. Add Bladex to the spray tank first, followed by Poast, and the appropriate amount of Assist last. Maintain continuous agitation while filling and spraying. Apply when broadleaf weeds are in the 1-4 leaf stage and grass weeds are in the 1-6 leaf stage, no later than the 4-leaf stage of the crop.
2. Mix BLADEX at the recommended rate with LONTREL at 0.75-1.5 L/ha (0.3-0.6 L/ac) to control broadleaf weeds and Canada thistle in **triazine tolerant canola**. Apply at the 3-4 leaf stage of the crop. Add Bladex to the spray tank first, followed by Lontrel. Maintain continuous agitation while filling and spraying.
3. Do not mix with any other pesticides, fertilizers or spray adjuvants.

Blagal (cyanazine and MCPA-K 1:2) — DuPont

Activity: 375 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rate of Product**
Wheat (spring, durum) Barley Oats	2.25 L/ha (0.9 L/ac)

At 2.25 L/ha one 10 litre container treats 4.4 ha (11.0 ac).

Weeds controlled: Tartary buckwheat, wild buckwheat, smartweed, lady's-thumb, hemp-nettle, stinkweed, corn spurry, chickweed, lamb's-quarters, ball mustard, wild mustard, wormseed mustard, tumble mustard, wild radish, top growth control of Canada thistle and field horsetail, other weeds controlled by 1.1 L/ha MCPA (0.45 L/ac).

Application:

Apply in 100 L of water/ha (40 L/ac) at 200-300 kPa (30-44 psi). Thorough coverage is necessary for good results. Maintain continuous agitation during mixing and application. Use 50 mesh screens or larger. DO NOT use felt filters. DO NOT use flood jet or hollow cone nozzles.

Timing:

Apply when the cereal crop is in the 2-5 leaf stage. Spray after weeds have one true leaf and before they have five leaves.

Mode of Action:

Cyanazine inhibits photosynthesis causing yellowing of leaves and eventual death of susceptible plants. Crops under stress from lack of moisture or extreme temperatures may show temporary yellowing. MCPA susceptible weeds will show typical MCPA symptoms.

Precautions:

1. DO NOT overlap.
2. Avoid prolonged contact with skin.
3. DO NOT graze or feed the immature crop from the treated area to livestock.
4. DO NOT treat cereals underseeded to forage or green manure legumes.
5. DO NOT spray if rainfall is expected within 4 hours.

Mixing:

DO NOT mix with other herbicides or wetting agents.

amine formulation. Refer to 2,4-D/MCPA section.

Buctril-M (bromoxynil and MCPA 1:1) Rhone Poulenc

Activity: 560 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate of Product
Wheat (spring, durum, winter), barley, oats, flax, fall rye, canary seed, Seedling grasses (bromegrass, crested wheatgrass, intermediate wheatgrass, slender wheatgrass, tall wheatgrass, Russian wild ryegrass, timothy, orchardgrass, creeping red fescue, meadow fescue and reed canarygrass) when sown for seed production in the year of establishment only.	1.0 L/ha (0.40 L/ac)

At 1.0 L/ha two 8 litre containers treat 16 ha (39.5 ac).

Weeds controlled: Cow cockle (seedling to 4-leaf stage), green smartweed, lady's-thumb, Russian thistle (seedling to 5 cm (2 in.) high), tartary buckwheat, wild buckwheat, lamb's-quarters, stinkweed, wild mustard, redroot pigweed, night-flowering catchfly, kochia, common groundsel, ball mustard, flixweed, tumble mustard, wormseed mustard, scentless chamomile (spring annuals only), bluebur, shepherd's-purse, common ragweed, volunteer sunflowers, volunteer canola, cocklebur American nightshade, top growth control of Canada thistle and perennial sow-thistle.

Note: Buctril-M is not registered for the control of redroot pigweed when applied to flax.

Application:

Apply in 100 L of water/ha (40 L/ac).

Timing:

1. Buctril-M can be safely applied in the spring to cereals from the 2-leaf stage until the appearance of the flag-leaf and to flax when the crop is 5-10 cm (2-4 in.) tall. Apply to seedling grasses in the 2-4 leaf stage and to canary seed in the 3-5 leaf stage. Best results are obtained from applications made at the early leaf stages.
2. Buctril-M can be applied in the fall to winter wheat in the 2-4 leaf stage.

Mode of Action:

Bromoxynil is a contact herbicide. Therefore thorough coverage of the weeds is required for good control.

Precautions:

1. In flax, some leaf burn and retarded growth may delay maturity 2-3 days. Severe injury may result if flax is treated when the plants are under stress.
2. DO NOT apply mixtures containing bromoxynil during hot, humid weather as this may result in temporary leaf scorch.
3. DO NOT apply if rainfall is expected within 30 minutes.
4. DO NOT graze or harvest for livestock feed within 8 weeks of application.

Mixing:

1. Mix BUCTRIL-M at the recommended rate with AVENGE 200-C at 3.5-4.25 L/ha (1.40-1.70 L/ac) to control broadleaf weeds and wild oats in **barley** and those varieties of **wheat** and **fall rye** registered for Avenge. Apply in 100 L of water/ha (40 L/ac) when the wild oats are in the 3-5 leaf stage. Add the broadleaf herbicide at start of filling then fill tank to 3/4 full and add AVENGE 200-C. Top off spray with remaining water.
2. Mix BUCTRIL-M at the recommended rate with MCPA formulations (MCPA-K preferred) at 0.56 L/ha (0.23 L/ac) to control hemp-nettle in **wheat**, **barley** and **oats**.
3. Mix BUCTRIL-M at the recommended rate with TCA at 1.3 kg/ha (0.53 kg/ac) to control green foxtail and broadleaf weeds in **barley**. In **oats** mix TCA at 1.3-2.7 kg/ha (0.53-1.10 kg/ac). Apply in 100-150 L of water/ha (40-60 L/ac) when green foxtail has 1-3 leaves and the crop 2-4 leaves.
4. Mix BUCTRIL-M at the recommended rate with POAST at recommended rates to control broadleaf and grassy weeds in **flax**. Apply in a minimum 100 L of water/ha (40 L/ac) when the grass weeds are in the 2-5 leaf stage and flax is 5-10 cm (2-4 in.) tall. Follow the mixing instructions as recommended for Poast. This tank-mix may increase the possibility of crop scorch.
5. Mix BUCTRIL-M at the recommended rate with GLEAN at 15 g/ha to control broad-leaved weeds including hempnettle in **wheat** and **barley**. Refer to the Glean label for all precautions including limitations on soil pH and crop rotations.

Dyvel (dicamba + MCPA K 1:4) Sandoz

Activity: 420 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rate of Product**
Wheat, (spring, durum, winter) barley, oats	1.25 L/ha (0.5 L/ac)

At 1.25 L/ha one 10 litre container treats 8.0 ha (19.8 ac).

Weeds controlled: Hemp-nettle*, cow cockle, wild buckwheat, green smartweed, lady's thumb, corn spurry, Russian thistle, lamb's-quarters, pigweed (prostrate, redroot, Russian), mustards (except dog mustard), ragweeds, stinkweed, cocklebur, tartary buckwheat, kochia, cleavers*, volunteer sunflowers, flixweed, shepherd's-purse, wild radish, burdock, annual sow-thistle, top growth control of Canada thistle and perennial sow-thistle.

*Suppression only

Application:

Use at least 100 L of water/ha (40 L/ac) to reduce the risk of crop injury.

Timing:

1. Although Dyvel is registered for application to the 2-5 leaf stage of wheat, oats and barley, in Saskatchewan it is recommended to spray at the 2-4 leaf stage of wheat and oats and the 3-leaf stage of barley. Treatment at the 3-leaf stage of the crop will usually combine maximum crop tolerance and weed susceptibility. In winter wheat apply in spring when the crop is 15-25 cm (6-10 in.) tall, before the shot blade stage.
2. Application after the 4-leaf stage or at low water volumes will usually result in stem bending and delayed maturity. Under conditions conducive to prolific tillering, the yield may also be reduced. Very severe yield losses due to sterility will result from treatment during the flag leaf to the early heading stage.

Mode of Action:

Dyvel is a translocated herbicide, which affects the roots of the plant. It is slower acting than most other broadleaf herbicides and death of the plants may take 2-3 weeks.

Precautions:

1. DO NOT use on cereals underseeded to legumes.
2. DO NOT freeze.
3. DO NOT apply if rainfall is expected within 4 hours.
4. DO NOT graze or harvest for livestock feed prior to crop maturity.
5. For sprayer clean-up directions refer to Banvel.

Mixing:

DO NOT tank-mix DYVEL with other pesticides, fertilizers or spray adjuvants.

Edge DC, Granular (ethalfluralin)

DowElanco

Activity: Edge DC 60% water dispersible concentrate
Edge Granular 5% granules

Registered Uses:

Crops	**Recommended Rates of Product**			
	Spring		**Fall**	
	Edge DC	**Edge Granular**	**Edge DC**	**Edge Granular**
Canola, mustard, peas, sunflowers, fababeans, safflower, seedling alfalfa (seed production only), dry beans (white, kidney)	1.4-1.9 kg/ha (0.56-0.75 kg/ac)	17-22 kg/ha (6.8-8.9 kg/ac)	1.9-2.3 kg/ha (0.75-0.9 kg/ac)	22-28 kg/ha (8.9-11.3 kg/ac)

The rate of application used will be determined by season of application, soil zone, % soil organic matter and soil texture (light: sand, sandy loam/medium to heavy: loam, silt loam, silt, sandy clay loam, silty clay loam, loam, clay, clay loam, silty clay).

Use the **lower** rate of application on light-textured soils in the dark brown soil zone with 2-4% organic matter or in the black soil zone with 4-6% organic matter or on medium to heavy textured soils in the dark brown soil zone with 2-4% organic matter.

Use the **higher** rate of application on light-textured soils in the deep black soil zone with 6-15% organic matter or on medium to heavy textured soils in the black soil zone with 4-6% organic matter or in the deep black soil zone with 6-15% organic matter. For Edge DC spring application use 2.3 kg/ha (0.9 kg/ac) for improved results on medium-heavy soils with 6-15% organic matter.

At 1.6-2.8 kg/ha one 9.1 kg bag treats 5.7-3.3 ha (14.0-8.2 ac).

At 17-28 kg/ha one 22.7 kg bag treats 1.3-0.8 ha (3.2-2 ac).

Weeds Controlled: Wild oats, volunteer wheat, green and yellow foxtail (wild millet), barnyard grass, wild buckwheat, redroot pigweed, lamb's-quarters, cow cockle, corn spurry, chickweed, kochia, prostrate pigweed, purslane.

Weeds Suppressed[4]: Hemp-nettle, lady's thumb, Russian thistle, volunteer barley, cleavers, nightshade.

[4] Suppression is a visual reduction in weed competition (reduced population and/or vigour) as compared to an untreated area.

Application and Timing:

Do not apply Edge to peat or muck soils, wet soils, soils in poor working condition, or soils which contain less than 2% organic matter or more than 15% organic matter, or soils that are subjected to prolonged periods of flooding.

Apply at the recommended rates as it pertains to soil texture and organic matter.

Cultivate to destroy existing weeds before Edge application. When applying to stubble fields, chop and thoroughly mix crop residues into the soil to a depth of 10 cm (4 in.). Disc type implements provide the best results. To avoid concentrations of wild oat seeds below the treated layer, do not plow (moldboard) land prior to Edge application.

Mixing Instructions for Edge DC:

VIGOROUS, CONTINUOUS AGITATION IS ESSENTIAL FOR PROPER MIXING. Simple return line agitation is not sufficient. Jet or perforated pipe agitation is required to create a rippling or rolling action on the surface. All in-line screens should be 50 mesh or coarser. A 16 mesh screen is recommended for the filter on the inlet side of the pump.

1. Use at least 100 litres of water/ha (40 L/ac).
2. Fill the tank 1/3 full with clean water. Begin agitation before addition of Edge DC. Proper agitation is very important.
3. Add all of the required packets of Edge DC to the tank. Do not pre-slurry. Agitate for 10 minutes before filling tank.
4. The use of an anti-foaming agent is recommended.
5. Continue agitating for 5 minutes after sprayer filling is completed and continue until the end of the spray operation.

CONTINUE AGITATION THROUGHOUT THE ENTIRE FILLING AND SPRAYING OPERATION.

Application:

Apply Edge DC in at least 100 L of water/ha (40 L/ac) using any properly calibrated low pressure field sprayer with uniform spray patterns. Apply Edge Granular uniformly with a properly calibrated herbicide applicator.

Spring — apply Edge to the soil surface. Incorporate in the same operation if possible. Do not delay incorporation more than 24 hours after application. The second incorporation may be done at the time of seedbed preparation, provided it is done at the recommended depth.

Fall — apply Edge to the soil surface between September 1 and prior to soil freeze-up for weed control the following year.

The initial incorporation must be done within 24 hours after application. It is preferred to do both incorporations in the fall followed by shallow tillage (5-8 cm) in the spring prior to planting. However, one incorporation may be done in the fall and the second in the spring at the time of seedbed preparation, provided both operations are done at the recommended depth.

Spring tillage following fall application of Edge should be done when the soil is warm enough to promote germination. Use a disc or vibrashank cultivator operated at 5-8 cm (2-3 in.) deep. Avoid transplanting weed seedlings; seed into a weed-free seedbed using accepted cultural practices.

Incorporation:

To incorporate, work Edge into the soil in two different directions. Use a tandem disc, discer or field (vibrashank type) cultivator set to work 8-10 cm (3-4 in.) deep for the first incorporation. Disc or cultivate in a cross direction at the same depth. Operate disc implements at 7-10 km/h (4-6 mph) and cultivators at 10-13 km/h (6-8 mph).

Note: For more effective weed control, it is recommended that the second incorporaiton MUST be delayed at least 3 days following the first incorporation. This allows time for greater release of EDGE GRANULAR onto soil particles and assures more uniform distribution in soils.

- A single incorporation will not properly incorporate Edge and may result in poor weed control and/or crop damage.
- Rodweeders, harrows, deep tillage cultivators, chisel plows, or hoe drills will not properly incorporate Edge.
- Edge should not be incorporated with a field cultivator when the soil is crusted, lumpy, or too wet for good mixing action.
- Disc type implements are preferred on stubble to ensure 10 cm (4 in.) depth of operation.
- Incorporation with implements set to cut less than 8 cm (3 in.) deep or more than 10 cm (4 in.) deep may result in erratic weed control or crop damage.

Note: Speeds in excess of 8 km/h (5 mph) will result in excessive pulverization and trash reduction leaving fields susceptible to erosion. The maximum recommended tillage depth for Saskatchewan is 10 cm (4 in.). Fall application is not recommended on soils where a lack of trash cover combined with the required incorporation could result in soil erosion.

Mode of Action:

Edge controls susceptible weeds by killing germinating weeds. It does not control established weeds.

Precautions:

1. Occupational exposure to this product may be hazardous to your health. When handling, mixing or applying pesticides, farm workers are subject to potential dermal (skin) exposure. Occupational exposure studies have shown that with the proper use of protective clothing, much of the potential exposure to Edge can be reduced. To minimize exposure, the following precautions should be followed when using Edge:
    - Wear protective clothing such as coveralls, a long-sleeved shirt and impermeable rubber gloves.
    - Change contaminated clothing daily and wash before reuse.
    - Do not handle product with bare hands. Impermeable gloves significantly reduce hand exposure. It is important to wear gloves for the mixing/loading operation and when making sprayer and nozzle repairs and adjustments. Do not use leather or cloth gloves.
    - Rinse gloves with soapy water before removal and wash hands thoroughly before eating, drinking or smoking.
2. **Edge will not provide acceptable control of trifluralin tolerant green foxtail.**
3. Applied and incorporated according to directions and under normal growing conditions, Edge will not harm the treated crop. Seedling disease, **COLD WEATHER, DEEP PLANTINGS**, excessive moisture, high salt concentrations or drought, may weaken crop seedlings and increase risk of damage from Edge resulting in delayed crop development or reduced yields.
4. When used as directed, Edge will not harm the treated crop or typical rotational crops. As a precaution, very sensitive crops such as small-seeded annual grasses such as Timothy or Canaryseed Grass should not be grown in rotation to an Edge treated crop.

5. Edge will not harm rotational crops if applied as directed. Over-application caused by overlapping, improper calibration, non-uniform application, etc. may reduce stands of treated crops or crops that follow in rotation.
6. **DO NOT apply to soils with less than 2% organic matter. Application to eroded knolls or variable grey-wooded soils may result in reduced crop stand.**
7. Edge DC is packaged in water soluble packets for direct placement into the spray tank. Refer to product label for handling and storage instructions. DO NOT freeze water soluble packets.
8. Keep Edge out of direct sunlight.

Mixing:

DO NOT mix Edge DC with any other pesticide or fertilizer.

Embutox 625/Cobutox 2,4-D Butyric 400/SEE 2,4-DB (2,4-DB)

Rhone Poulenc/IPCO
United Agri Products

Note: These products are recommended for use on cereals underseeded to forage legumes (except sweet clover).

Activity:

Embutox 625	625 g active ingredient/litre
2,4D Butyric 400	400 g active ingredient/litre
Cobutox	400 g active ingredient/litre
SEE 2,4-DB	480 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates of Product** **Butyric 400/Cobutox**	 **Embutox 625**	 **SEE 2,4-DB**
Wheat (spring, durum), barley, oats, seedling alfalfa, bird's-foot trefoil, alsike clover, red clover, white clover	2.75-3.5 L/ha (1.1-1.4 L/ac)	1.75-2.25 L/ha (0.7-0.9 L/ac)	2.25-3.0 L/ha (0.9-1.2 L/ac)
Pastures containing forage legumes	2.75-4.25 L/ha (1.1-1.7 L/ac)	1.75-2.75 L/ha (0.7-1.1 L/ac)	2.25-3.5 L/ha (0.9-1.4 L/ac)

At 2.75-3.5 L/ha one 20 litre container of Butyric 400 or Cobutox treats 7.3-5.7 ha (18.0-14.1 ac).
At 1.75-2.25 L/ha one 8 litre container of Embutox treats 4.6-3.6 ha (11.3-8.8 ac).
At 2.25-3.0 L/ha one 10 litre container of SEE 2,4-DB treats 4.4-3.3 ha (11.1-8.3 ac).

Weeds controlled: Ragweed, redroot pigweed, mustards (wild, wormseed, ball), lamb's-quarters, stinkweed, shepherd's-purse.

Suppression or Top Growth Control: Oakleaf goosefoot, plantain, yellow rocket, chicory, wild buckwheat, wild radish, lady's-thumb, smartweed, bull thistle, perennial sow-thistle, Canada thistle, curled dock, narrow-leaved hawk's-beard, field bindweed, horsetail, dandelion.

Application and Timing:

1. Apply in 150-200 L of water/ha (60-80 L/ac) when the legumes are in the 1-4 trifoliate leaf stage (1-2 for SEE 2,4-DB) and when the cereal crop is between the 4-leaf and flag-leaf stages.
2. In pastures containing forage legumes apply after cutting or grazing when the regrowth is not above 7.5 cm (3 in.) tall.
3. Use the lower rate of application on susceptible weeds in the seedling stage (2-4 leaf stage). Use the higher rates for older, heavy weed infestations and under poor growing conditions or for the suppression or top growth control of the weeds listed.

Mode of Action:

Mode of action is similar to 2,4-D and MCPA.

Precautions:

1. DO NOT use on sweet clover.
2. Oats are susceptible to damage if treated before 5-leaf stage.
3. Embutox 625 or SEE 2,4-DB may be stored at freezing temperatures but must be returned to its original state by warming to room temperature (20-22 C) and agitating thoroughly on several successive days before use. DO NOT freeze 2,4D Butyric 400 or Cobutox.
4. Rainfall before foliage has dried from spraying may decrease activity.
5. There are no grazing restrictions.
6. Not all brands of 2,4-DB are registered for the same uses. Refer to product labels for complete details.

Mixing:

1. Mix EMBUTOX 625 at 1.25 L/ha (0.5 L/ac) or 2,4D BUTYRIC 400 or COBUTOX at 2.0 L/ha (0.8 L/ac) with MCPA amine at 70 mL/ha (28 mL/ac) for improved control of wild mustard in **seedling alfalfa** and **bird's-foot trefoil**. This tank-mix may increase crop stunting.

Eptam-8E (EPTC) — ICI Chipman

Activity: 798 g active ingredient/litre

Registered Uses: **Crops**	**Recommended Rate of Product**
Sunflowers, dry beans, seedling alfalfa, seedling bird's-foot trefoil	4.25 L/ha (1.7 L/ac)
Flax*	3.5-4.25 L/ha (1.4-1.7 L/ac)

At 4.25 L/ha one 20 L container treats 4.7 ha (11.6 ac).

Weeds controlled: Barnyard grass, corn spurry, green and yellow foxtail (wild millet), wild oats, chickweed, lamb's-quarters, prostrate pigweed, purslane, redroot pigweed, tumble pigweed, volunteer cereals (barley, wheat, oats).

Application:

Apply to a dry, trash free soil surface in 100 L of water/ha (40 L/ac) and incorporate immediately.

Timing:

Apply in spring prior to seeding. Although registered, fall application is not recommended in Saskatchewan because of the risk of soil erosion due to the extent of incorporation required.

Incorporate immediately. Tandem discs should be set to cut 10-15 cm (4-6 in.) and operate at a speed of 7-10 km/h (4.3-6.2 mph) and followed by a spike toothed harrow or some other leveling device which extends beyond the ends of the discs. On medium and heavy textured soils two workings at right angles are required. On light sandy soils, one operation may be adequate. One-way discs should be set to cut 12.5-15 cm (5-6 in.) deep and operated at 7-10 km/h (4.3-6.2 mph) and followed by a spike-toothed harrow or some other leveling device which extends beyond the ends of the discs. Cross discing is required for adequate incorporation. Field cultivators can be used in light soils which are in good tilth. Use 3 or 4 rows of sweeps spaced at 17.5 cm (7 in.) intervals or less followed by a spike-toothed harrow pulled behind the cultivator. Use 17.5 cm (7 in.) or wider sweeps. Set the cultivator to cut 12.5-15 cm (5-6 in.) deep and operate at a minimum of 10 km/h (6.2 mph). Run the equipment over the field twice. The second run should be at an angle to the first.

Mode of Action:

Eptam controls susceptible weeds by interfering with germination and normal seedling development.

Precautions:

*1. Although EPTAM-8E is registered for use in flax, it is not recommended for use in Saskatchewan because of the risk of crop phytotoxicity.
2. DO NOT apply to moist or trashy soil surfaces.
3. EPTAM-8E is volatile and will be lost rapidly especially from a wet soil surface. Incorporate within minutes of application, preferably in the same operation.
4. DO NOT freeze. If frozen, warm to room temperature and shake well on several successive days.
5. EPTAM-8E is not a persistent herbicide. Late germinating weeds may not be controlled. Therefore, seed as soon as possible after treatment. Shallow cultivation may be necessary to control late germinating weeds.
6. **Note:** Speeds in excess of 8 km/h (5 mph) will result in excessive pulverization and trash destruction leaving fields susceptible to erosion. The maximum recommended tillage depth for Saskatchewan is 10 cm (4 in.).
7. Eptam is very soluble in water and excessive moisture may leach Eptam from the surface.

Mixing:

EPTAM-8E may be tank-mixed with liquid and granular fertilizers except for nitrate based fertilizers. DO NOT mix with other pesticides or spray adjuvants.

Estaprop/Diphenoprop 600/SEE Diphenoprop (dichlorprop and 2,4-D 1:1)

Rhone Poulenc/ United Agri Products

Activity:

Estaprop	600 g active ingredient/litre
Diphenoprop 600	600 g active ingredient/litre
SEE Diphenoprop	444 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate of Product Estaprop/Diphenoprop 600	 SEE Diphenoprop
Wheat (spring, durum, winter), barley	1.75 L/ha (0.7 L/ac)	2.3 L/ha (0.9 L/ac)

At 1.75 L/ha two 8 litre containers treat 9.14 ha (22.6 ac).
At 2.3 L/ha one 10 litre container treats 4.3 ha (10.8 ac).

Weeds controlled: Annual sow-thistle, mustards (ball, dog, hare's-ear, Indian, tumble, wild, wormseed), bluebur, burdock, cocklebur, flixweed, kochia, lady's-thumb, lamb's-quarters, oak-leaved goosefoot, ragweeds, redroot pigweed, Russian pigweed, Russian thistle, shepherd's-purse, smartweeds, stinkweed, stork's-bill, tartary buckwheat, wild buckwheat, round-leaved mallow*, night-flowering catchfly, volunteer canola and volunteer sunflower.

Top-growth control of Canada thistle, curled dock, perennial sow-thistle. Under poor growing conditions, lady's-thumb, smartweeds and buckwheats will be suppressed but not completely controlled. *Refer to Special Weed Problems Section for comments on round-leaved mallow control.

Application:

Apply in 100 L of water/ha (40 L/ac).

Timing:

Apply from 4-leaf stage to just before the flag-leaf stage of the crop. Best results will be obtained when applied to rapidly growing weeds in the 2-4 leaf stage. In winter wheat apply in spring after full tillering but before the shot blade stage.

Mode of Action:

Similar to 2,4-D and MCPA.

Precautions:

1. Slight crop injury may result but where weed infestation is heavy this should be overcome by reduced weed competition.
2. DO NOT use on grain underseeded to legumes.
3. There is no information available on grazing restrictions or the effect of rainfall after application.
4. Damage to the crop may result if application is made before the 4-leaf stage.

Mixing:

1. Mix ESTAPROP or DIPHENOPROP 600 at the recommended rate with AVENGE 200-C at 3.5-4.25 L/ha (1.40-1.70 L/ac) or AVENGE 280-C at 2.5-3.0 L/ha (1.0-1.2 L/ac) to control broadleaf weeds and wild oats in barley and those varieties of wheat registered for Avenge. Apply in 100 L of water/ha (40 L/ac) when wild oats are in the 3-5 leaf stage and the crop is at the 4-6 leaf stage. DO NOT apply before the 4-leaf stage of the crop. Add Estaprop or Diphenoprop 600 at the start of filling then fill tank to 3/4 full and add Avenge. Top off tank and remaining water.
2. Do not mix with any other pesticides, fertilizers or spray adjuvants.

Excel (fenoxaprop-ethyl) **Hoechst**

Activity: 90 g active ingredient/litre

Registered Uses:

Crop	Recommended Rates of Product
Canola, triazine-tolerant canola, peas, tame buckwheat, tame mustard	2.25 L/ha (0.9 L/ac)
Lentil, sunflowers, flax	2.5 L/ha (1 L/ac)

At 2.25-2.5 L/ha one 10 litre container treats 4.5-4.0 ha (11-10 ac).

Weeds Controlled: Wild oats, green and yellow foxtail (wild millet), barnyard grass, volunteer barley, volunteer corn.

Application:

1. Apply in 100 L of water/ha (40 L/ac) at 275 kPa (40 psi) and at a ground speed of 6-8 km/h (4-5 mph).
2. Direct the spray pattern 45 degrees forward and adjust boom height to ensure optimum coverage. Use of 80 or 110 stainless steel flat nozzles is recommended.
3. DO NOT use flood jet nozzles or controlled droplet application equipment.

Timing:

1. Apply Excel when wild oats, green and yellow foxtail, and barnyard grass are in the 1-6 leaf stage (including tillers). For volunteer barley, apply when the barley is in the 1-6 leaf stage (including tillers). For volunteer corn, apply when the corn is 5-25 cm (2-10 in.) in height. For best weed control and greater yield enhancement apply Excel when annual grass weeds are small and actively growing.

Mode of Action:

Excel is a contact and systemic herbicide with no soil activity. Symptoms include reduced leaf growth and yellowing of the treated plants within 1-3 days. Chlorosis progresses and death of the plant occurs in 14-21 days after application.

Precautions:

1. DO NOT graze treated crop prior to harvest.
2. DO NOT apply if rainfall is expected within 3 hours.
3. DO NOT apply by aircraft.
4. DO NOT delay application if annual grass weeds are in the correct stage for Excel application before broadleaved weeds have emerged.
5. DO NOT freeze. If stored for one year or longer, shake well before using.
6. A time interval of 4 days before or after application of Excel is required before any pesticide or other chemical is applied (except those registered for use with Excel).
7. During periods of prolonged cool (12 C or less), when daytime temperatures are very hot (28 C or higher) and/or conditions are very dry and/or there is low humidity, plants are under stress and not actively growing. Application of Excel during these periods may result in substantially reduced weed control. Under these conditions yellow blotches may appear on crop leaves. These blotches will be rapidly outgrown and will not affect maturity or yield.

Mixing:

Excel can be tank-mixed with the following broadleaf herbicides. In all mixes, ensure that the broadleaf herbicide is added to the spray tank BEFORE adding Excel.

1. Mix EXCEL at 2.25 L/ha (0.9 L/ac) with LONTREL at 0.75 L/ha (0.3 L/ac) for the control of wild oats, green and yellow foxtail, volunteer barley, Canada thistle and certain broadleaved weeds in **canola,** and **triazine tolerant canola.**
2. MIX EXCEL at 2.25 L/ha (0.9 L/ac) with BLADEX Liquid at 3.0 L/ha (1.2 L/ac) for the control of wild oats, green and yellow foxtail, volunteer barley, wild mustard, stinkweed and other Bladex susceptible broadleaved weeds in **triazine tolerant canola**. DO NOT use on any other varieties of canola.
3. DO NOT mix Excel with any other pesticides, fertilizers or additives (except those registered for use with Excel).

NOTE: Under certain environmental conditions (for example stress due to lack of moisture, prolonged periods of either cold or excessively hot daytime temperatures or low humidity), when plants are not actively growing, application of a tank mixture should be avoided.

Fortress (triallate & trifluralin 10:4) **Monsanto**

Activity: 14% granules

Registered Uses:
Crops

Recommended Rates of Product
Based on % Organic Matter

Fall	**Less than 2%**	**2-4%**	**4-6%**	**6-8%**	**8%**
Wheat (spring, durum)	Not Recommended	11 kg/ha (4.5 kg/ac)	14 kg/ha (5.7 kg/ac)	14 kg/ha (5.7 kg/ac)	17 kg/ha (6.9 kg/ac)
Barley	11 kg/ha (4.5 kg/ac)	14 kg/ha (5.7 kg/ac)	14 kg/ha (5.7 kg/ac)	17 kg/ha (6.9 kg/ac)	17 kg/ha (6.9 kg/ac)
Flax, canola and mustard	14 kg/ha (5.7 kg/ac)	14 kg/ha (5.7 kg/ac)	14 kg/ha (5.7 kg/ac)	17 kg/ha (6.9 kg/ac)	17 kg/ha (6.9 kg/ac)

Spring	**Less than 2%**	**2-4%**	**4-6%**	**Greater than 6%**
Wheat (spring, durum)	Not Recommended	Not Recommended	11 kg/ha (4.5 kg/ac)	14 kg/ha (5.7 kg/ac)
Barley	Not Recommended	11 kg/ha (4.5 kg/ac)	14 kg/ha (5.7 kg/ac)	17 kg/ha (6.9 kg/ac)
Flax, canola and mustard	14 kg/ha (5.7 kg/ac)	14 kg/ha (5.7 kg/ac)	17 kg/ha (6.9 kg/ac)	17 kg/ha (6.9 kg/ac)

Wheat or barley seeded into a fall or spring application of this product must be seeded using either a hoe drill or double disc press drill only. Seed must be placed below the treated layer to reduce the chance of crop injury.

At 11-17 kg/ha one 22.7 kg bag treats 2.1-1.3 ha (5.1-3.3 ac).

Weeds Controlled: Wild oats, green foxtail (wild millet).

Application:

Apply in **fall** after September 15 and before freeze-up and incorporate or **spring** before seeding.

Note: In long open falls, early application prior to October 1 may lead to excessive Fortress losses and a reduction in wild oat control. Till the following spring at depths no greater than 7.5 cm (3 in.) to avoid dilution of the chemical which could result in reduced weed control and possible injury to sensitive crops such as wheat and barley. When seeding wheat into fall treated soils, very careful attention must be paid to placing the seed at a uniform depth below the layer of treated soil. Placement of seed into treated soil will result in stand reduction and delayed maturity. Thinning is minimized when the seed is placed below the treated soil layer. Thinning is usually more than offset by increased tillering.

Field Preparation:

Before applying this product be sure the soil is in good working condition. All deep tillage by cultivation or double disc implements must be completed prior to application of this product. If excessive trash is present additional tillage or other appropriate trash management practice will be necessary to reduce the trash cover to an acceptable level before application as too much trash can make uniform incorporation difficult.

If the soil is excessively wet or lumpy making proper incorporation difficult, cultivation with suitable tillage equipment may be required before application and incorporation to improve the soil condition. If ridging is a problem, suitable tillage is recommended prior to application to eliminate the ridging and ensure uniform distribution of the herbicide.

Incorporation:

This product must be incorporated into the soil, using suitable tillage equipment, in order to provide weed control. Two incorporation operations at right angles to one another is necessary for thorough mixing of this product in the soil. The first incorporation should be completed within 24 hours of application. The second incorporation may be done during the fall or delayed, until the spring. A delay of the second incorporation for at least 5 days (fall) after the first incorporation will allow a greater release of product and more effective weed control.

Incorporate by setting the tillage equipment to work the soil no deeper than 7.5-10 cm (3- 4 in.).

Shallow incorporation is necessary to prevent dilution of the product, thus decreasing weed control and increasing the risk of crop injury.

Harrowing does not provide effective incorporation if compact soil prevents penetration of harrow teeth or if trash accumulates in the harrow section or if harrows bounce.

Only one incorporation is required in the fall. The second incorporation may be done either in the fall (prior to soil freeze-up) or in the spring. If the second incorporation is done in the spring it may be done any time until crop emergence. If the second incorporation is conducted after seeding it should be done with a harrow or other suitable tillage equipment adjusted to a depth so as not to disturb the seed. If ridging is a problem after seeding, one harrowing is recommended to eliminate the ridging and ensure uniform distribution of the herbicide.

For spring application the second incorporation may be done after seeding but before crop emergence. If the second incorporation is done after seeding then it should be done with harrows to a depth so as not to disturb the seed. For best results delay the second incorporation for at least 7 days following the first.

Seeding Depth:

Seed wheat and barley at a depth of 5-7.5 cm (2-3 in.). It is especially important that wheat seed be below the treated layer of soil to reduce the chance of crop injury. Do not seed deeper than 7.5 cm (3 in.). To ensure an even crop stand, increase the usual seeding rate of wheat or barley by 10%.

General:

Some wild oat seedlings may emerge before being killed. As growth ceases, the leaves become brittle and bluish green in color. Seedlings that germinate in treated soil are killed quite rapidly. Seedlings that germinate below the treated layer are killed more slowly and the amount of growth prior to death increases as the depth of the seed increases. A seedling emerging from a depth of 15 cm (6 in.) may reach a height of more than 5 cm (2 in.) before it dies. On the other hand, wild oat plants that reach the two-leaf stage before the Fortress is activated by sufficient moisture may still be controlled. Green foxtail seedlings will generally be controlled as they germinate.

Precautions:

1. Fall application is not recommended on soils where a lack of trash cover combined with the required incorporation operation could result in soil erosion.
2. Substantial thinning in wheat and barley following treatment has been known to occur especially under conditions of heavy rainfall and/or cold weather after application and before crop emergence. To minimize thinning pay careful attention to incorporation and seeding depth instructions.
3. Some wheat or barley injury may be noted on eroded knolls.
4. Oats, small-seeded forage grasses and canary seed should not be grown in rotation following a Fortress treated crop.
5. DO NOT apply Fortress for wheat on land which has been treated with Advance, Free Flow, Rival, Treflan, Heritage or Triflurex since June 1 of the previous year.
6. There are no grazing restrictions.
7. Rainfall or moisture is necessary for activation. Rainfall before incorporation may increase the loss of Fortress to the atmosphere.
8. Under conditions of prolonged cool soil temperatures at the time of germination or extreme drought in the spring, weed control may be reduced.

Mixing:

DO NOT mix Fortress with other pesticides or fertilizers.

Free Flow 10G (trifluralin)

United Agri Products

Activity: 10% granules

Registered Uses:

Crops	**Recommended Rates of Product** **Fall**
Canola, triazine tolerant canola, sunflowers, peas, mustard, fababeans	11-17 kg/ha (4.5-6.9 kg/ac)
Flax, lentils	11-17 kg/ha (4.5-6.9 kg/ac)
Barley[1]	8.5-14 kg/ha (3.4-5.7 kg/ac)

Summer Application:
Flax, triazine tolerant canola, fababeans and canola only -- 17.0 kg/ha (6.9 kg/ac).

At 11-17 kg/ha one 22.7 kg bag treats 2.1-1.3 ha (5.1-4.0 ac).

Weeds Controlled: Wild oats, green and yellow foxtail (wild millet), barnyard grass, wild buckwheat, cow cockle, redroot pigweed, lamb's-quarters, Russian thistle, chickweed, purslane, knotweed, Persian darnel.

[1] Use 8.5 kg/ha (3.4 kg/ac) in soils with 2-4% organic matter.
Use 11.0 kg/ha (4.5 kg/ac) in soils with 4-6% organic matter.
Use 14 kg/ha (5.7 kg/ac) in soils with 6-10% organic matter (except sandy and sandy loam soils).

Application:

1. Use recommended granular application equipment.
2. For sandy or sandy loam soils with less than 6% organic matter, use the lower rate. All medium to heavy soils (loams and clays) with 6-15% organic matter, use higher rates depending on extent of wild oat infestation.
3. Do not apply to soils which contain more than 15% organic matter, such as peat or muck soils, wet soils that are subject to excessive flooding or soils in poor working conditions.
4. All weeds should be eliminated through discing or cultivation before applying Free Flow. For application to stubble and trashy soils, thuroughly disc soils to ensure crop residues and trash have been mixed into the soil to a maximum depth of 10 cm (4 in.).
5. Do not fall apply Free Flow to soils subject to erosion by wind, water or other factors. Fall application to summerfallow with low trash cover or light textured soils may predispose field to erosion and is not recommended.

Timing:

Summer - apply to summerfallow between June and September 1 and incorporate immediately, in the same operation if possible. Do not delay incorporation more than 24 hours after application. All further incorporations may be done at any time during the fallow season. Shallow till in spring after the soil has warmed.

Fall - apply between September 1 and soil freeze-up. Incorporate immediately, in the same operation if possible. Do not delay incorporation more than 24 hours after application. The second incorporation may be done in the fall or spring at the time of seedbed preparation. Delay second incorporation for 5 days after first incorporation to allow greater release of product and more effective weed control. A shallow tillage in spring prior to seeding is required if second incorporation is done in the fall.

Incorporation:

For Oilseed and Pulse Crops:
Incorporate with disc implements or cultivators only. A tandem disc is recommended for the first incorporation. Do not delay first incorporation more than 24 hours after application. The first incorporation should be in the same direction as application with the second incorporation at right angles to the first. For summer or fall applications, a shallow tillage is required in the spring prior to seeding if both incorporations are done in the fall.

Incorporate to a depth of 8-10 cm (3-4 in.). Disc implements should be operated at 7-10 km/h (4.2-6.2 mph) and cultivators at 10-13 km/h (6-8 mph). Deep tillage cultivators, chisel plows, rod weeders, harrows or hoe-drills are not recommended.

Special Instructions for Flax and Lentils:

1. Both incorporations should be done in summer or fall before seeding in the spring. For lentils, apply Free Flow 10G in fall only.
2. A shallow tillage and packing of seedbed in the spring is recommended to ensure a firm seedbed and maintain a constant planting depth.

3. Seed to a depth of 2-4 cm (.8-1.6 in.) into a moist seedbed when soil temperatures are warm (usually after mid-May). Environmental factors which delay crop germination and emergence will increase the risk of damage resulting in a delay in crop maturity and/or reduced yields.

Directions for fall application of Free Flow 10G in barley:

1. Do not use barley rates of application in other registered crops.
2. Do not apply Free Flow 10G for barley on land treated with Rival, Treflan, Heritage, Free Flow, Advance or Triflurex since June 1 of the previous year.
3. Use varied recommended rates for soils of organic matter up to 10%. Do not apply to soils with more than 10% organic matter or less than 2% organic matter.
4. Application to severely eroded knolls may result in reduced crop stand.
5. Initial incorporation must be within 24 hours of application to a depth of 8-10 cm (3-4 in.). Second incorporation should also be done in fall at right angles to first, and delayed for 5 days for maximum weed control effectiveness.
6. Do not seed when soil conditions are cold. Seeding should be done with drills into warm, moist seedbeds. If air seeder or discers are used, avoid variable seeding depth and ensure a firm seedbed by packing after seeding.

Mode of Action:

Free Flow controls susceptible weeds through the roots as they germinate. It does not control susceptible weeds that have emerged through the soil at the time of application.

Precautions:

1. **Free Flow will not control trifluralin tolerant green and yellow foxtail (wild millet). Trifluralin tolerant green foxtail populations have built up because trifluralin has been repeatedly used for many years as the major herbicide in a field. Populations of green foxtail tolerant to trifluralin herbicides have appeared in some areas of Saskatchewan. For further information regarding weed resistance to herbicides refer to page 9.**
2. Fall application of Free Flow is not recommended to soils subject to erosion by wind, water of other factors, to summerfallow with low trash cover or to a light textured soil which may predispose the field to erosion.
3. DO NOT apply to peat or muck soils, wet soils subject to excessive flooding, soils with more than 15% organic matter, or soils in poor working condition.
4. Highly sensitive crops such as tame oats, canary seed, sugar beets and forage grasses should not be grown in rotation the year after Free Flow application.
5. A risk of damage to treated crop from Free Flow may result if factors such as deep planting, excessive moisture, cold temperatures, seedling disease, poor soil fertility, drought or saline soils weaken crop emergence. A delay in crop maturity and/or reduced yields may result.
6. **Crop injury to wheat may result in the second year of a crop rotation following dry soil conditions during the first crop year after Free Flow 10G is used. To reduce injury to wheat, seed the crop shallow when a warm, moist seedbed is present.**
7. Avoid concentrating Free Flow 10G in narrow bands. Use properly calibrated granular application for uniform application to soil surface.
8. Injury to wheat and barley may occur if seeded into a deeply incorporated layer of Free Flow.
9. If manure is applied to field, thoroughly mix with 2 tillage operations before applying Free Flow. Fields that have been burned for trash management should be tilled once before Free Flow is applied.
10. DO NOT use a moldboard plough before Free Flow application.
11. DO NOT store in direct sunlight.
12. DO NOT store in granular applicators for more than 24 hours.
13. There are no grazing restrictions.

Note: Speeds in excess of 8 km/h (5 mph) will result in excessive pulverization and trash reduction leaving fields susceptible to erosion. The maximum recommended tillage depth for Saskatchewan in 10 cm (4 in.). Fall application is not recommended on soils where a lack of trash cover combined with the required incorporation could result in soil erosion.

Fusilade 250/Fusilade II (fluazifop-butyl) ICI Chipman

Activity:		
	Fusilade 250	250 g active ingredient/litre
	Fusilade II	125 g active ingredient/litre

Registered Uses:

Crops

Flax, canola, triazine tolerant canola, sunflowers, seedling and established alfalfa, seedling and established red clover, seedling and established bird's-foot trefoil, seedling and established creeping red fescue

Recommended Rates of Product and Weeds Controlled:

Note: These rates of product are for both formulations.
At 0.6 L/ha (0.24 L/ac): Volunteer corn
At 0.8 L/ha (0.32 L/ac): All of the above plus barnyard grass, Persian darnel, volunteer wheat and volunteer barley.
At 1.0 L/ha (0.4 L/ac): All of the above plus wild oats, proso millet and suppression of green and yellow foxtail (wild millet); and suppression of quackgrass in canola only.
At 1.4 L/ha (0.56 L/ac): All of the above plus green and yellow foxtail (wild millet). Do not use foxtail rate in canola if using Fusilade 250.
At 2.0 L/ha (0.8 L/ac): All of the above plus quackgrass top growth control on tilled land. Do not use quackgrass rate in canola if using Fusilade 250.
At 0.8-1.4 L/ha one 8 litre container treats 10-5.7 ha (25-14.1 ac).

Application:

1. Apply in a minimum water volume of 100 L/ha (40 L/ac) at a pressure of 200 to 300 kPa (30-44 psi). The use of standard flat fan nozzles is recommended.
2. Agral 90 must be added to all applications of Fusilade 250 alone at a rate of 1 L for ever 1,000 L of spray solution (0.1% by volume). Agral 90 is not required with Fusilade II.

Timing:

Apply to actively growing annual grasses at the 2-5 leaf (including tillers) stage. Best control is obtained when applied before annual grasses tiller. For foxtails apply at the 2-4 leaf stage. Fusilade will provide seasonal control of quackgrass when applied at the 3-5 leaf stage. Tillage prior to application to fragment quackgrass rhizomes is required. This can be done in the fall or spring before seeding. Do not cultivate for 5 days after application.

Mode of Action:

Fusilade is a systemic herbicide which is translocated from treated leaves to growing points. Thorough and uniform coverage of the entire leaf area is important for consistent grass control. Susceptible grasses stop growing and slowly turn brown, then red. Complete control takes 21-28 days.

Precautions:

1. **Warning:** Experimental feeding studies in rats have demonstrated that the active ingredient in this product can produce birth defects and other adverse effects in the developing fetus of rats. Women capable of bearing children should be particularly careful when handling this product. Occupational exposure to this product will be reduced by strict adherence to the handling precautions and use directions provided.
   - All users must follow all handling precautions, use directions and clean-up procedures noted on the label.
   - Wear coveralls, boots, and PVC (liquid proof) gloves when spraying or when adjusting, repairing, or cleaning equipment.
   - Wear coveralls, boots and PVC (liquid proof) gloves and safety goggles when handling the concentrate.
   - Avoid spray mist by staying upwind from the spray and/or by wearing a suitable mask or respirator. Wash thoroughly with soap and water after handling and before eating or smoking. Remove contaminated clothing and wash before re-use. Wash hands thoroughly with soap and water before using a new pair of gloves.
   - Use PVC gloves supplied with product and dispose of if damaged or after use. Dispose of gloves immediately if contaminated on the inside. Wash hands thoroughly with soap and water before using a new pair of gloves. Be sure sprayer tank is clear of debris and all sprayer nozzles and screens are clean and clear of obstructions before loading the sprayer with FUSILADE to eliminate contamination of clothing and skin by the need to clear blocked nozzles after spraying commences.

2. DO NOT apply if rainfall is expected within 2 hours.
3. Allow 3 days between applications of Fusilade or Fusilade II and any other herbicide.
4. DO NOT graze or harvest crops for forage in the year of treatment.
5. DO NOT apply by aircraft.
6. DO NOT apply within 15 m (50 ft.) of fish bearing waters and wildlife habitats.
7. Seed only broadleaf crops listed on the label if it is necessary to reseed a crop within 60 days of application.
8. AVOID CAUSING SPRAY DRIFT TO SUSCEPTIBLE CEREAL OR GRASS CROPS and wash sprayer thoroughly after use to avoid damage to susceptible crops.
9. DO NOT exceed 1.0 L/ha on canola when using Fusilade 250.
10. When grasses are stressed due to lack of moisture, low temperature and/or very low relative humidity, control can be reduced or delayed.
11. Refer to label for interval to harvest details.

Mixing:

1. Mix FUSILADE 250 or Fusilade II at the required rate with 2,4-DB;

   (a) EMBUTOX 625 at 1.75-2.25 L/ha (0.7-0.9 L/ac), or

   (b) BUTYRIC 400 or COBUTOX at 2.75-3.5 L/ha (1.1-1.4 L/ac),

   in 150-200 L of water per ha (60-80 L/ac) to control broadleaf and grassy weeds in **seedling alfalfa, seedling red clover and seedling bird's-foot trefoil**. Apply when legumes are in the 1-4 trifoliate leaf stage. DO NOT add Agral 90 when Fusilade is tank-mixed with 2,4-DB.
2. Mix FUSILADE 250 or Fusilade II at the required rate (maximum 1.0 L/ha) with LONTREL at 0.75-1.5 L/ha (0.3-0.6 L/ac) to control grassy weeds and some broadleaf weeds including Canada thistle in **canola**. The addition of Agral 90 to the tank mixture is required for Fusilade 250 only. Apply when the grassy weeds are in the correct growth stage and Canada thistle is greater than 10 cm (4 in.) tall. The canola should be in the 3-5 leaf stage.
3. Mix FUSILADE 250 or Fusilade II at the required rate (maximum 1.0 L/ha) with BLADEX liquid at 3.0 L/ha (1.2 L/ac) to control grassy weeds and broadleaf weeds in **triazine tolerant canola**. The addition of Agral 90 to the tank mixture is required for Fusilade 250 only. Apply when the grassy weeds are in the correct growth stage and broadleaf weeds are in the 1-4 leaf stage, no later than the 4-leaf stage of the crop.
4. Mix FUSILADE 250 at 0.4 L/ha (0.16 L/ac) with POAST at 0.54 L/ha (0.21 L/ac) to control annual grassy weeds in **canola** and **flax**. Apply in 100 L of water/ha (40 L/ac) and add Assist or Superior Oil Concentrate (SOC) at a rate of 5 L for every 1000 L of spray solution (0.5% by volume). Fill the tank 1/2 full with clean water and add the products in the following order: Fusilade 250, then Poast, then Assist or SOC. Continuous agitation is required. Note: At the time of printing Fusilade II was not registered in a tank-mix with Poast.

Glean (chlorsulfuron) — Use Only as a Tank-mix as Indicated. **DuPont**

Activity: 75% dry flowable

Registered Uses:

Crops	**Recommended Rates of Product**
Wheat (spring, durum, winter), barley, oats	15 g/ha

At 15 g/ha one 500 g container treats 33.3 ha (82.4 ac).

Weeds Controlled: Lamb's-quarters, hemp-nettle, wild mustard, cow cockle, volunteer canola, redroot pigweed, stinkweed, lady's-thumb, green smartweed, flixweed, shepherd's-purse, stork's bill.

The spectrum of weeds controlled increases when tank-mixed with 2,4-D or MCPA. See Mixing Section A.

Application:

Add the proper amount of Glean to the required volume of water in the spray tank with the agitator running. Continuous agitation is required to keep the product in suspension. After Glean has been well mixed and is in suspension then add a spray adjuvant (e.g. Triton XR, Agsurf, Super Spreader, Agral 90, or Citowett Plus) at 100 mL for each 100 L of spray mixture (0.1%p by volume). Apply only with ground equipment in a minimum of 60 L of water/ha (25 L/ac) with flat fan nozzles. When using flood jet or raindrop nozzles apply 225 L/ha (90 L/ac) total spray volume. Use 50-mesh screens or larger.

Timing:

Apply when wheat, barley or oats are in the appropriate stage for the tank-mix selected. Best results are obtained when applied to small and actively growing weeds.

Mode of Action:

Glean is a systemic herbicide and rapidly stops growth of susceptible plants. However, typical symptoms (discoloration and wilting) of control may not be noticeable for 7-10 days after treatment.

Precautions:

1. **Some naturally occurring populations of certain weeds listed above will not be controlled by Glean, Ally, or Refine. These populations are able to survive a use rate several times higher than needed to control susceptible populations. To delay selection for resistant populations, rotate the use of Glean, Ally, and Refine with other herbicides effective on the same weeds. Do not use Glean, Ally and/or Refine repeatedly in the same field.**

   The Provincial Weed Committee advises against the use of Glean alone on land on which Glean has been used in the previous 4 years or Ally in the previous 2 years. For further information regarding weed resistance to herbicides refer to page 9.
2. The additive effective of soil residues from the use of Glean and Assert 300-LC herbicide on the same land has not been determined. Refer to "Soil Residual Herbicides" section for further detail.
3. Apply only on land having a soil pH of 7.5 or lower.
4. FOR CROP ROTATION FLEXIBILITY DO NOT USE GLEAN ON ALL LAND IN WHEAT OR BARLEY PRODUCTION. Refer to product label or the following table for recropping guidelines.
5. DO NOT allow spray mixture to remain in the tank for more than 24 hours before spraying, or effectiveness may be reduced. Use vigorous agitation to thoroughly disperse spray mixtures that have been allowed to stand in the tank.
6. DO NOT apply or allow drift onto desirable plants or non-target land areas, cropland, water, irrigation or drainage ditches.
7. DO NOT apply to wheat, barley or oats undersown with other crops as injury to other crops will occur.
8. DO NOT exceed a total of 15 g product/ha within a 12 month period.
9. DO NOT apply by aircraft.
10. Immediately after spraying, thoroughly clean all traces of Glean from application equipment to avoid possible injury to other crops.

    (a) Drain tank then flush tank, boom and hoses with clean water for a minimum of 10 minutes.

    (b) Fill tank with clean water, then add 1 litre household ammonia (containing a minimum 3% ammonia) per 100 litres of water (1% by volume). Flush through boom and hoses then allow to sit for 15 minutes with agitation; then drain. Note: DO NOT use chlorine bleach with ammonia.

    (c) Repeat Step b.

    (d) Nozzles and screens should be removed and cleaned separately. To remove traces of chlorine bleach rinse tank thoroughly with clean water and flush through hoses and boom.
11. SEE LABEL FOR DETAILED PRECAUTIONS AND FOLLOW ALL LABEL DIRECTIONS.

Mixing:

A. To increase the spectrum of broadleaf weeds controlled in **wheat** (spring, durum), **barley** and **oats** and to delay the selection of resistant weed populations, mix GLEAN at 15 g/ha with any of the following:
   - (a) 2,4-D amine at 0.84-1.1 L/ha (0.34-0.45 L/ac).
   - (b) 2,4-D LV ester 600 at 0.7-0.9 L/ha (0.28-0.37 L/ac).
   - (c) 2,4-D LV ester 700 at 0.6-0.8 L/ha (0.24-0.32 L/ac).
   - (d) MCPA amine at 0.7-1.1 L/ha (0.28-0.45 L/ac).
   - (e) MCPA ester at 0.7-1.1 L/ha (0.28-0.45 L/ac).

DO NOT use 2,4-D on oats. Add a recommended surfactant at the rate of 1 L per 1000 L of spray volume. Apply the tank-mix from the full 3-leaf stage to just before the flag-leaf stage. Ensure that Glean is completely in suspension in the spray tank before adding 2,4-D or MCPA. On repeat tank loads, prepare a Glean/water slurry and add it to the required water volume in the spray tank prior to adding 2,4-D or MCPA.

B. Glean alone can be tank-mixed with the following herbicides. In all mixes ensure that Glean is completely in suspension before adding the other herbicide. Continous agitation is required. Unless stated otherwise, DO NOT add surfactant. Apply in 100 L of water/ha (40 L/ac). DO NOT apply by air.

1. Mix GLEAN at the recommended rate with AVENGE 200-C at 4.25 L/ha (1.70 L/ac) to control wild oats and broadleaf weeds in **barley** and those varieties of **wheat** registered for AVENGE 200-C. DO NOT use this tank-mix during periods of stress (i.e. dry conditions, low humidity or when plants are not actively growing) since applications under these conditions may result in significantly reduced wild oat control.
2. Mix GLEAN AT 15 g/ha with HOE-GRASS at 2.8 L/ha (1.1 L/ac) to control annual broadleaf weeds and **wild oats only** in **wheat** (spring, durum, winter) and **barley** (except Klages, Norbert and Betzes). This tank-mix does not control green or yellow foxtail, Persian darnel or barnyard grass.
3. Mix GLEAN at the recommended rate with MATAVEN L at 5.0 L/ha (2.0 L/ac) to control broadleaf weeds and wild oats in **wheat** (spring, durum).
4. Mix GLEAN at the recommended rate with STAMPEDE 360 at 2.75 L/ha (1.1 L/ac) to control annual broadleaf weeds and green foxtail in **wheat** (spring, durum) and **barley** (Argyle, Bedford and Klages only). When both products are in suspension, add 0.1% by volume of a recommended surfactant (1 litre for every 1,000 litres of spray solution).

The following recropping and rotation intervals should be observed after using GLEAN unless a successful field bioassay has been completed. The minimum recropping or rotation interval is from the time of last application to the anticipated date of planting.

INTERVAL PRIOR TO PLANTING		**INTERVAL (months)**							
Soil pH	**Soil Zone**	Wheat (spring, winter)	Wheat, Durum	Barley	Oats	Canola	Peas	Flax	Lentils
7.0 or lower	Black & Grey Wooded with organic matter over 5%	2	10	10	10	22	34	48	48
	Dark Brown	2	10	10	10	34	*	*	*
	Brown	2	10	10	10	34	*	*	*
7.1 to 7.5	Black & Grey Wooded with organic matter over 5%	2	10	22	22	34	34	*	*
	Dark Brown	2	10	22	22	*	*	*	*
	Brown	2	10	22	22	*	*	*	*
Over 7.5	Do Not Use								

Unless soil pH, soil zone, crop, or minimum rotation interval is as specified in the above table, the completion of a successful field bioassay* is required before planting a crop in soil treated with Glean.

* Refer to Field Bioassay section of label for complete instructions.

NOTE: If rainfall is less than 250 mm (10 in.) in the black/grey wooded or 130 mm (5 in.) in the brown or dark brown soil zones in any year between GLEAN application and planting of canola, peas, flax or lentils, extend the rotation interval one year, unless a field bioassay confirms the absence of Glean residues.

Heritage 5G (trifluralin) Elanco

Activity: 5% granules

Registered Uses:

Crops	**Date of Application**	**Recommended Rates of Product**	
		Sand/Sandy Loam	
		1-3% O.M.	**4-8% O.M.**
Wheat (spring, durum) for Brown Soil Zones	May	19 kg/ha (7.7 kg/ac)	22 kg/ha (9 kg/ac)
	June	16 kg/ha (6.5 kg/ac)	19 kg/ha (7.7 kg/ac)
	July	13 kg/ha (5.3 kg/ac)	16 kg/ha (6.5 kg/ac)
		2-8% O.M.	
	Sept.-Oct.[1]	11 kg/ha (4.5 kg/ac)[5]	

Weeds Controlled: Fallow Year[2] - Green foxtail (wild millet), wild oats, Persian darnel, barnyard grass, wild buckwheat, cow cockle, lamb's-quarters, redroot pigweed.

Crop Year - Green foxtail (wild millet) lamb's-quarters, wild oats[3], wild buckwheat[4].

[1] Do not fall apply Heritage to stubble when the current years crop was treated with another trifluralin product (eg. Treflan, Heritage, Rival or Triflurex). This includes application made in the spring or previous summer or fall. Do not fall apply Heritage to stubble or fallow when the previous years crop was an oilseed, barley, or pulse crop treated (in the sriping or fall prior to seeding) with a deep incorporated trifluralin product (eg: Treflan, Rival or Triflurex).

[2] During the fallow year, susceptible weeds may not be fully controlled until after the second fallow operation has established a uniform layer of soil treated with Heritage.

[3] Control of wild oats in the crop year may be variable depending on wild oat population as well as soil and climatic conditions.

[4] Some wild buckwheat may escape the herbicidal action of Heritage but its growth will be retarded and result in limited competition to the wheat.

[5] Control of green foxtail (wild millet) only.

Application and Timing:

1. Do not apply to sandy soils with less than 1% organic matter. Application to severly eroded knolls is not recommended.
2. Do not apply to wet soils, soils in poor working condition, soild which contain more than 8% orgaic matter, or soils subject to prolonged periods of flooding.
3. Heritage may be applied to standing or pre-worked stubble, provided trash or green growth does ot interfere with cultivation (prevent soil mixing).
4. An over-application caused by overlapping, improper applicator calibration or non-uniform application, may result in reduced crop stand, delayed development or reduced yields.

Incorporation:

Refer to Incorporation of Soil-Applied Herbicides section on page 5 for general incorporation procedures.

May-July - apply Heritage to the soild surface and incorporate immediately, in the same operation if possible. Do not delay incorporation more than 24 hours after application. Use a deep tillage cultivator, field cultivator or disc implement set to work 5-8 cm (2-3 in.) deep. A second incorporation at the same depth and at an angle to the first, should be done when weed growth requires it. After completing two fallow incorporations, additional operations with a rod weeder, shallow tillage, or fall 2,4-D application, may be required to control resistant weed growth.

September -October - apply Heritage after harvest until freeze-up, and incorporate immediately if possible with a deep tillage cultivator, field cultivator or disc implement set to work 5-8 cm (2-3 in.) deep. Do not delay incorporation more than 24 hours after application. A second incorporation may be done in the fall, a minimum or three days later. Alternatively, to conserve trash cover throughout the winter, the second incorporation should always be done at the same depth and at an angle to the first incorporation. Heritage should not be incorporated when the soil is crusted, lumpy, or too wet for good mixing action. Fall application is not recommended on soils where a lack of trash cover combined with the required incorporation could result in soil erosion.

Spring Tillage for Seedbed Preparation:

Seedbed preparation should be done using a field cultivator set to cut 5 cm (2 in.) deep when the soil is warm enough to promote good germination. Avoid transplanting weed seedlings; seed into a weed-free seedbed using a double disc drill or hoe drill set to seed 3-6 cm (1.2-2.4 in.) deep.

If a discer or air seeder is used for seeding, separate spring tillage may not be necessary. The discer or air seeder should be set to placed seed 3-6 cm (1.2-2.4 in.) deep and the seedbed should be firmly packed or harrowed after seeding to promote good germination.

To reduce the risk of wheat injury, use quality seed and agronomic practices which will promote good growing conditions. **Note: Avoid deep seeding, loose seedbeds, and seeding into cold soils.**

Mode of Action:

Heritage controls susceptible weeds by killing seedlings as they germinate. It does not control established weeds.

Precautions:

1. **Heritage will not control trifluralin tolerant green and yellow foxtail (wild millet). Trifluralin tolerant green foxtail populations have built up because trifluralin has been repeatedly used for many years as the major herbicide in a field. Populations of green foxtail tolerant to trifluralin herbicides have appeared in some areas of Saskatchewan. For further information regarding weed resistance to herbicides refer to page 9.**
2. Prolonged drought conditions after a May-July application of Heritage to fallow may result in higher levels of trifluralin in the soil at the time of seeding. To reduce the possibility of crop injury in this situation, seed the crop 3-6 cm (1.2-2.4 in.) deep into a warm, moist seedbed.
3. Store in areas not exposed to high temperatures, prolonged direct sunlight, or moisture. Do not let product remain in the granular applicator under these conditions. After filling the granular applicator, close the lid immediately to avoid prolonged exposure to direct sunlight.
4. Applied and incorporated into the soil according to directions, Heritage will not injure the treated crop. However, over-application or improper incorporation as well as deep planting, disease, cold weather, excessive moisture, high salt concentration, or drought at the time of planting and early seedling growth, may weaken crop seedlings and increase the risk of injury from Heritage, resulting in reduced crop stand, delayed development or reduced yields.
5. There are not grazing restrictions.
6. Oats, canary seed and forage grasses should not be grown in rotation following a Heritage treated wheat crop.
7. Note: Speeds in excess of 8 km/h (5 mph) will result in excessive pulverization and trash reduction leaving fields susceptible to erosion. The maximum tillage depth recommended for Saskatchewan is 10 cm (4 in.). Application is not recommended on soils where a lack of trash cover combined with the required incorporation could result in soil erosion.
8. **Note:** Correct incorporation and seed placement are essential for the successful use of this product. Follow all label directions carefully.

Hoe-Grass (diclofop methyl) — Hoechst

Activity: 284 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates of Product**
Wheat (spring, durum, winter), flax, canola, tame buckwheat, tame mustard, barley*, peas, lentils, dry beans (white, black, pinto), fababeans, spring and fall rye, triticale, sunflowers, bromegrass**, creeping red fescue**, crested wheatgrass**, intermediate wheatgrass**, Russian wild ryegrass**, alfalfa**, red clover**, sweet clover**, alsike clover (for seed production only)**, Sainfoin (for seed production only)**	2.5-2.8 L/ha (1.0-1.13 L/ac)

At 2.5-2.8 L/ha one 20 litre container treats 8.0-7.1 ha (19.8-17.6 ac).

Weeds controlled: Wild oats, green and yellow foxtail (wild millet), Persian darnel, barnyard grass, volunteer corn. *Caution should be used when applying Hoe-Grass to Klages, Betzes and Norbert varieties of barley. There is a risk of crop injury under cool, humid conditions or if the crop has been subjected to drought or frost.
**Use in year of establishment only. DO NOT use Forage for Feed.

Application:

1. Apply in 100 L of water/ha (40 L/ac) at 275 kPa (40 psi).
2. Direct the spray pattern 45 degrees forward for best results. Adjust boom height to ensure uniform coverage.
3. Apply at least 4 days before applying broadleaf herbicides. Only Pardner, Refine, Glean or Lontrel can be tank-mixed with Hoe-Grass.

Timing:

1. Optimum weed control is achieved when wild oats, green foxtail and yellow foxtail, and barnyard grass are in the 1-4 leaf stage, and when Persian darnel is in the 1-3 leaf stage. For volunteer corn, apply when the corn is 15-25 cm (6-10 in.) in height.
2. For wild oats only, in the 4-5 leaf stage, apply Hoe-Grass at 2.8 L/ha. Note: Hoe-Grass effectiveness declines if wild oats at the 4-5 leaf stage have tillered and are not actively growing.
3. Apply to barley in the 1-4 leaf stage and prior to tillering (usually not later than 21 days after emergence of the barley). Application beyond the 4-leaf stage or after tillering may result in damage.

Mode of Action:

Symptoms of Hoe-Grass appear in 2-3 days as a yellowing of the treated plants. Chlorosis progresses and death of the plants occurs in about two weeks.

Precautions:

1. DO NOT graze treated crop.
2. DO NOT apply if rainfall is expected within one hour.
3. DO NOT freeze.
4. Thoroughly clean sprayer of all other herbicide (i.e. 2,4-D, MCPA, dicamba, etc.) residues before applying Hoe-Grass.
5. Allow at least 4 days before using broadleaf herbicides. DO NOT apply broadleaf herbicides before using Hoe-Grass.
6. During periods of stress, plants are not actively growing. When daytime temperatures are very hot (28C) and/or conditions are very dry and/or there is low humidity, plants are under stress. Application of Hoe-Grass during these periods may result in substantially reduced weed control. Under these conditions, yellow blotches may appear on crop leaves. These blotches will be rapidly outgrown and will not affect maturity or yield.
7. Apply before tillering of grassy weeds.

Mixing:

1. Mix HOE-GRASS at 2.8 L/ha (1.13 L/ac) with PARDNER at 1.0 L/ha (0.4 L/ac) to control grassy and broadleaved weeds in **wheat** and **barley** (refer to variety precautions). Apply in 100 L of water/ha (40 L/ac) at a pressure of 275 kPa (40 psi). Apply when the weeds are in the 1-3 leaf stage and before the grassy weeds have tillered. Do not apply to barley after the 4-leaf stage or more than 21 days after emergence. During periods of stress (i.e. very hot (28 C) and/or dry conditions or low humidity) plants are not actively growing. Better control of grassy weeds will be

achieved if HOE-GRASS is applied alone rather than as a tank-mix with PARDNER under these conditions. Stinkweed and wild mustard must be sprayed at a very early stage for optimum control.

2. Mix HOE-GRASS at 2.8 L/ha (1.13 L/ac) with LONTREL at 1.0 L/ha (0.40 L/ac) to control grassy and certain broadleaf weeds and Canada thistle in **canola**. This tank mixture controls wild oats in the 1-4 leaf stage only.
3. Mix HOE-GRASS at 2.8 L/ha (1.13 L/ac) with GLEAN at 15 g/ha to control annual broadleaf weeds and wild oats only in **wheat** and **barley** (refer to variety precaution). This tank-mix does not control green or yellow foxtail, Persian darnel or barnyard grass. Careful attention must be paid to all precautions and recropping instructions on the Glean label. DO NOT apply this mixture by aircraft. Ensure Glean is in suspension before adding Hoe-Grass, continuous agitation is required. When using Glean in a tank-mix with Hoe-Grass the use of a surfactant is not required.
4. Mix HOE-GRASS at recommended rates with DECIS 5.0 EC insecticide to control annual grassy weeds and labelled insect pests at correct growth stages in wheat, barley (except Betzes, Norbert and Klages), flax, canola and mustard.
5. Mix HOE-GRASS at 2.5-2.8 L/ha (1.0-1.13 L/ac) with REFINE at 20 g/ha to control annual broadleaf weeds and wild oats only in **wheat** and **barley** (refer to variety precaution). This tank-mix does not control green or yellow foxtail, Persian darnel or barnyard grass. Careful attention must be paid to all precautions and instructions on the Refine label. Do not apply this mixture by aircraft. Ensure Refine is in suspension before adding Hoe-Grass, continuous agitation is required. When using Refine in a tank-mix with Hoe-Grass the use of a surfactant is not required.

Hoe-Grass II (diclofop methyl and bromoxynil 23:8) **Hoechst**

Activity: 310 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rate of Product**
Wheat (spring, durum), flax, triticale, spring rye, barley* and seedling grasses grown for seed only (bromegrass, creeping red fescue, Russian wild ryegrass, crested wheatgrass, intermediate wheatgrass)	3.5 L/ha (1.40 L/ac)

At 3.5 L/ha one 20 litre container treats 5.7 ha (14.1 ac).

Weeds controlled: Wild oats, green and yellow foxtail (wild millet), Persian darnel, barnyard grass, volunteer corn, wild and tartary buckwheat, lady's-thumb, green smartweed, kochia, common groundsel, knawel, night-flowering catchfly, cow cockle, wild mustard, scentless chamomile, stinkweed, lamb's-quarters, redroot pigweed, Russian thistle.

*Caution should be used when applying Hoe-Grass II to Klages, Betzes and Norbert varieties of barley. There is a risk of crop injury under cool, humid conditions if the crop has been subjected to drought or frost.

Application:

1. Apply in 100 L of water/ha (40 L/ac) at 275 kPa (40 psi) and a ground speed of 6-8 km/h (3.8-5 mph).
2. Direct the spray pattern 45 degrees forward and adjust boom height to ensure optimum coverage. Use of 80 degree stainless steel flat fan nozzles is recommended.
3. DO NOT apply an additional herbicide within a minimum of 4 days after Hoe-Grass II application.

Timing:

1. Optimum weed control is obtained when grassy weeds are in the 1-4 leaf stage and when the broadleaf weeds are in the seedling to 4-leaf stage. For Persian darnel apply at the 1-3 leaf stage, for volunteer corn apply when corn is 15-25 cm (6-10 in.) in height, and for Russian thistle apply when height is 5 cm (2 in.) or less.
2. Stinkweed and wild mustard must be sprayed at a very early stage for optimum control.
3. Apply when flax is 5-10 cm (2-4 in.) tall, and when barley is in the 1-4 leaf stage, and prior to tillering. Application beyond the 4-leaf stage of barley or after tillering may result in crop damage.

Mode of Action:

Grassy weed control symptoms of Hoe-Grass II appear in 2-3 days as a yellowing of the treated plants. Chlorosis progresses and death of the plant occurs in about 2 weeks. Broadleaf weed control is by contact action. Thorough coverage of the weeds is required for optimum results.

Precautions:

1. DO NOT graze treated crop.
2. DO NOT apply if rainfall is expected within one hour.
3. DO NOT freeze.
4. Thoroughly clean sprayer of all other herbicide residues before applying Hoe-Grass II.
5. Allow an interval of 4 days before using other herbicides.
6. Application of Hoe-Grass II during hot, humid weather may result in temporary leaf scorch. During periods of stress, plants are not actively growing. When daytime temperatures are very hot (28C) and/or conditions are very dry and/or there is low humidity, plants are under stress. Application of Hoe-Grass II during these periods may result in substantially reduced weed control. Under these conditions, yellow blotches may appear on crop leaves. These blotches will be rapidly outgrown and will not affect maturity or yield.

Mixing:

1. HOE-GRASS II is registered in a tank-mix with MCPA amine to control volunteer canola and wild mustard in wheat, barley, triticale and spring rye. However, due to inconsistent results and possible antagonism of grassy weed control this tank-mix is not recommended for use in Saskatchewan by the Provincial Weed Committee.
2. Mix HOE-GRASS II at the recommended rate with DECIS 5.0 EC insecticide for control of annual weeds and labelled insect pests at correct growth stages in wheat, barley and flax.
3. DO NOT mix with any other pesticides (except as recommended), fertilizers or any other chemicals or additives as this will reduce effectiveness of Hoe-Grass II.

Kerb 50-W (propyzamide) Rohm & Haas

Activity: 50% wettable powder

Registered Uses:

Crops	Recommended Rates of Product
Established pastures	0.9 to 1.1 kg/ha (0.36-0.45 kg/ac)
Established alfalfa, bird's-foot trefoil	1.75 to 3.25 kg/ha (0.7-1.3 kg/ac)

At 0.9-1.1 kg/ha one 2 kg bag treats 2.2-1.8 ha (5.5-4.5 ac).
At 1.75-3.25 kg/ha one 2 kg bag treats 1.14-0.62 ha (2.8-1.5 ac).

Weeds controlled:

0.9 to 1.1 kg/ha - Foxtail barley
1.75 kg/ha - Annual grasses, volunteer cereals, wild oats
2.25-3.25 kg/ha - Above weeds plus quackgrass, orchardgrass, timothy, chickweed.

Application and Timing:

1. Premix Kerb 50-W in water and apply uniformly with flat fan nozzles at a minimum 220 L of water/ha (90 L/ac). Only 50 mesh or larger metal filters and nozzles screens should be used. Maintain good agitation during mixing and spraying.
2. Apply to established pastures, seeded at least 2 years prior to application, between October 1 and freeze-up. Use 0.9 kg/ha (0.36 kg/ac) on brown, dark brown, or gray-wooded soils, and 1.1 kg/ha (0.45 kg/ac) on thin black or black soils.
3. Apply to established alfalfa or bird's-foot trefoil, pure stands only, from late September to early November. Best results are obtained when soil temperature is low but above freezing and soil moisture is high.

Mode of Action:

Kerb 50-W acts through root absorption. Moisture carries Kerb 50-W into the root zone killing germinating seedlings when they begin to grow in the spring.

Precautions:

1. DO NOT harvest or graze within 90 days after application of 3.25 kg/ha (1.3 kg/ac), or 60 days after rates less than 3.25 kg/ha (1.3 kg/ac).
2. DO NOT plant other crops in Kerb treated soil for 9 months following application.
3. DO NOT apply on high organic soils; peat, muck, or thick black soils.
4. DO NOT use in seed grass stands.
5. DO NOT use on stands of timothy.
6. Less tolerant grasses (Kentucky bluegrass) may experience a 10-20% stand reduction.

Mixing:

DO NOT tank-mix KERB 50-W with other herbicides, fertilizers or spray adjuvants.

Laser (fenoxaprop-ethyl + bromoxynil + MCPA, 1:4:4) **Hoechst**

Activity: 252 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate of Product
Wheat (hard red spring)	2.5 L/ha (1.0 L/ac)

At 2.5 L/ha one 20 litre container treats 8.0 ha (20.0 ac).

Weeds Controlled:

Green and yellow foxtail (wild millet), green smartweed, pale smartweed, lady's thumb, cow cockle (seedling to 4-leaf stage), cocklebur, redroot pigweed, flixweed, bluebur, shepherd's-purse, kochia, Russian thistle, scentless chamomile (spring annuals only), volunteer sunflower, volunteer canola, night-flowering catchfly, wild buckwheat, tartary buckwheat, stinkweed, wild mustard, ball mustard, lamb's-quarters, common groundsel, top growth control of Canada thistle and perennial sow-thistle.

Application:

1. Apply in 100 L of water/ha (40 L/ac) at 275 kPa (40 psi) and at a ground speed of 6-8 km/h (4-5 mph).
2. Direct the spray pattern 45 degrees forward and adjust boom height to ensure optimum coverage. Use of 80 or 110 stainless steel flat fan nozzles is recommended.
3. DO NOT use flood jet nozzles or controlled droplet application equipment.

Timing:

1. Optimum weed control is obtained when green and yellow foxtail are in the 1-6 leaf stage (including tillers), and when broadleaf weeds are in the seedling to 4-leaf stage. For kochia and Russian thistle, apply before plants reach 5 cm (2 in.) in height. For wild buckwheat, tartary buckwheat, stinkweed, wild mustard, ball mustard, lamb's quarters, and common groundsel, apply at the 1-8 leaf stage.
2. For best weed control and greater yield enhancement apply when weeds are small and actively growing.
3. Laser can safely be applied to hard red spring wheat from the 2-leaf stage until the early flag leaf stage.

Mode of Action:

Grassy weed control symptoms of Laser include reduced leaf growth and yellowing of the treated plants within 1-3 days. Chlorosis progresses and death of the plant occurs in 14-21 days after application. Broadleaf weed control is by contact action. Thorough coverage of the weeds is required for best results.

Precautions:

1. DO NOT apply to any crop other than hard red spring wheat, as crop damage may result.
2. DO NOT treat cereals underseeded to forages.
3. DO NOT graze treated crop prior to harvest.
4. DO NOT apply if rain is expected within 3 hours.
5. DO NOT apply by aircraft.
6. DO NOT use floodjet nozzles or controlled droplet application equipment.
7. DO NOT apply Laser within 60 days of harvest.
8. DO NOT freeze. If stored for one year or longer, shake well before using.
9. During periods of stress, plants are not actively growing. When daytime temperatures before or after application are very hot (28C) and/or conditions are very dry and/or there is low humidity, plants are under stress. Application of Laser during these periods may result in substantially reduced control. Under these conditions yellow blotches may appear on crop leaves. These blotches will be rapidly outgrown and will not affect maturity or yield.

Mixing:

DO NOT mix Laser with other pesticides, fertilizers or any other chemical additives.

Lexone DF (metribuzin) **DuPont**

Activity: 75% dry flowable

Registered Uses:

Crops	**Recommended Rates of Product**
Wheat (spring, durum)	275 g/ha (110 g/ac)
Barley (except Klondike)	275-350 g/ha (110-140 g/ac)
Field Peas	280-375 g/ha (110-150 g/ac)
Fababeans	Lexone + Treflan (tank-mix only) (See Below)

At 275-350 g/ha one 2.5 kg container treats 9.1-7.1 ha (22.5-17.6 ac).

Weeds controlled: Hemp-nettle, chickweed, corn spurry, lamb's-quarters, stinkweed, volunteer canola, wild mustard, tartary buckwheat, ball mustard, smartweed, lady's-thumb. Wild buckwheat is not controlled. Use the higher rate for best residual control of chickweed and hemp-nettle or when weed infestation is heavy.

Application:

Premix Lexone with water in a clean pail before adding to spray tank. Apply in 100 L of water/ha (40 L/ac). Sprayer should be equipped with tips no finer than 6502, 8002 or LF2, nozzle screens no finer than 50 mesh and 50 mesh or larger line strainers. A pump of sufficient capacity to provide adequate volume through the by-pass and/or jet agitation system is essential. Crop must be seeded at least 5 cm (2 in.) deep.

Timing:

Apply when the cereal crop is in the 2-5 leaf stage. Early application of Lexone to peas (prior to 15 cm (6 in.) vine length) in 170 L of water/ha (68 L/ac) reduces risk of crop injury. Use the higher rate of application on peas where weed infestation is dense. Do not use on peas seeded less than 5 cm deep or in soils with less than 3% organic matter. Allow 4-5 days after cool, wet weather before application of Lexone to peas.

Mode of Action:

Lexone is a systemic herbicide and kills susceptible plants by inhibiting photosynthesis. Control may not be noticeable for 7-10 days after treatment.

Precautions:

1. Lexone may be applied when the crop is wet with dew but weed control may be reduced if there is rainfall within 6 hours after application.
2. Initial temporary (7-10 days) lightening in crop color and occasionally a slight reduction in crop height may occur especially if frost or abnormally high temperatures occur within 1-2 days of application. If frost occurs prior to application, allow 4-5 days for crop to recover before applying Lexone.
3. DO NOT use on crops underseeded to forages.
4. DO NOT graze or feed treated cereal crops to livestock within 30 days of application. DO NOT harvest for grain within 60 days of application. For peas do not harvest or feed within 70 days of application.
5. Continuous agitation is required during spraying. Do not let spray mixture stand without agitation or settling may occur.
6. Allow a 4-5 day interval between application of Lexone and wild oat herbicides.
7. DO NOT use on field peas grown under irrigation.

Mixing:

1. Mix LEXONE DF at the rate recommended for **barley** or **wheat** with MCPA amine at .84-1.1 L/ha (0.34-0.45 L/ac) when the crop is in the 3-5 leaf stage.
2. Mix LEXONE DF at 275 g/ha (110 g/ac) with BANVEL (480 g/L) at 230 mL/ha (90 mL/ac) on **barley** and **wheat** when the crop is in the 2-3 leaf stage. Do not use on Klondike barley.
3. For broadleaf and grassy weed control in **fababeans** mix LEXONE DF at 400-550 g/ha (160-220 g/ac) with TREFLAN at 2.0-2.6 L/ha (0.8-1.1 L/ac) for fall application. For spring application mix LEXONE DF at 350-550 g/ha (140-220 g/ac) with TREFLAN at 1.5-2.0 L/ha (0.6-0.8 L/ac) in 100 L water/ha (40 L/ac) and incorporate immediately following recommendations for TREFLAN incorporation.

Lontrel (clopyralid)*

DowElanco

Activity: 200 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates of Product
Canola, seedling and established grasses including Kentucky bluegrass, smooth bromegrass, reed canary grass, creeping red fescue, meadow fescue, tall fescue, meadow foxtail, orchard grass, altai wild ryegrass, Russian wild ryegrass, timothy, crested wheatgrass, intermediate wheatgrass, slender wheatgrass, streambank wheatgrass for forage and seed production and tall wheatgrass for forage only.	0.75-1.5 L/ha (0.3-0.6 L/ac)
Wheat, barley, oats	0.75 L/ha (0.3 L/ac)
Flax	1.0-1.5 L/ha (0.4-0.6 L/ac)

At 0.75-1.5 L/ha one 4 litre container treats 5.3-2.7 ha (13.2-6.6 ac).

Weeds controlled:

0.75 L/ha - Canada thistle top growth control for 6-8 weeks.

1.0 L/ha - scentless chamomile, wild buckwheat, Canada thistle (season long control), top growth of perennial sow-thistle.

1.5 L/ha - above weeds plus extended Canada thistle control into the following year.

Application:

Apply in a minimum of 100-200 L of water/ha (40-80 L/ac), by ground equipment only, at pressures of 200-275 kPa (30-40 psi).

Timing:

1. Apply at the 3-6 leaf stage of canola, when weeds are actively growing. Canada thistle plants should be between 10 cm (4 in.) tall and the bud stages. Best results are obtained when Canada thistle is actively growing and soil moisture is adequate for rapid growth. Under dry soil conditions and poor growing conditions, control of Canada thistle may be severely reduced. Applications of Lontrel made after flowering of Canada thistle has initiated, will not provide satisfactory control.
2. Apply when flax is 5-10 cm (2-4 in.) tall.
3. Apply to wheat, barley or oats between the 3-leaf to flag leaf emergence stage.
4. Apply to seedling grasses at the 2-4 leaf stage. For established grasses apply at the shot-blade stage or in the fall after harvest or early spring.

Mode of Action:

Clopyralid is a growth regulator type of herbicide, which is primarily absorbed through the foliage and is translocated to all parts of the plants.

Precautions:

1. DO NOT apply Lontrel herbicide to, or let it come into contact with, sunflowers, legumes (including lentils and peas), fruits or vegetable crops, flowers or other desirable broadleaf plants.
2. If the sprayer has been used previously to apply 2,4-D, MCPA or similar herbicides it is imperative that the spray equipment be thoroughly cleaned before Lontrel herbicide is mixed in the spray tank. Trace contamination of these herbicides will result in damage to canola.
3. DO NOT apply by air.
4. Field previously treated with Lontrel can be seeded to wheat, oats, barley, rye, flax, rapeseed or summerfallowed. Do not seed to crops other than those listed the year following treatment. There are no cropping restrictions thereafter.
5. DO NOT freeze.
6. DO NOT apply if rainfall is expected within 6 hours.
7. In flax where Buctril-M or Hoe-Grass II (which damage the Canada thistle leaves) are used, Lontrel should be applied 7-14 days prior, or after an interval of 14 days. This allows the thistle to recover and resume growth.
8. Do not graze or harvest for hay within 60 days of treatment.
9. DO NOT use on crops underseeded to legumes.

Sprayer Clean-up:

1. Drain and flush the spray system with clean water, in an area well away from sensitive plants.
2. Fill the system with a 1:100 mixture of household ammonia and water; circulate the mixture through the system for five minutes, then let stand for 24 hours.
3. Drain the system and flush twice with clean water.

Mixing:

1. Mix LONTREL at recommended rates with POAST, HOE-GRASS or FUSILADE to control annual grassy weeds as well as Canada thistle in **canola**. Refer to the Poast, Hoe-grass or Fusilade labels for grasses controlled, rates, application instructions and use precautions.
2. Mix LONTREL at 0.75 L/ha (0.3 L/ac) with MCPA amine or ester at 0.84-1.1 L/ha (0.34-0.45 L/ac) for broad spectrum broadleaf weed control in **flax.** Apply when the flax is 5-10 cm (2-4 in.) high. This tank-mix may cause some delay in maturity.
3. Mix LONTREL at 0.5-0.75 L/ha (0.2-0.3 L/ac) with 2,4-D or MCPA, amine or ester, for broad spectrum broadleaf weed control in **wheat, barley** and **oats**. Refer to the label of each tank-mix product used for precautionary statements, directions for use, weeds controlled and any other restrictions. DO NOT use 2,4-D on oats.

*This product has a temporary registration. Additional technical information is required in relation to its use. Be advised that the current label may be revised. Directions for use and cautionary statements should be carefully followed.

Lorox L (linuron) + MCPA (1:2) - Tank-Mix **DuPont**

Activity:		
	Lorox L	480 g active ingredient/litre
	MCPA amine	500 g active ingredient/litre
	MCPA K (potassium salt)	400 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates of Product**
Wheat (spring, durum), oats, barley	425-550 mL/ha (170-220 mL/ac) + 1.1 L/ha (0.45 L/ac) MCPA amine
Wheat (spring, durum), barley	425-550 mL/ha (170-220 mL/ac) + 1.0-1.4 L/ha (0.40-0.57 L/ac) MCPA K

At 425-550 mL/ha one 10 litre container treats 23.5-18.2 ha (58.1-44.9 ac).

Weeds Controlled: Wild buckwheat, tartary buckwheat, green smartweed, cow cockle, hempnettle, corn spurry, chickweed, redroot pigweed, prostrate pigweed, Canada thistle top growth. All weeds controlled by 1.1 L/ha MCPA (0.45 L/ac).

Application:

1. Apply in 100 L of water/ha (40 L/ac).
2. Use the lower rates when growing conditions and rainfall are above average.
3. When using a flowable formulation certain precautions and sprayer adjustments must be made to ensure that it is applied correctly. Be sure that the sprayer is equipped with 50 mesh line strainers and screens. Stainless steel or hardened stainless nozzles are recommended. Also, pumps must be of sufficient capacity for adequate agitation through the by-pass or jet agitator which should terminate in the bottom of the tank.

Note: a jet agitator should never be put on the end of the by-pass line because a high back pressure develops on the pump and system when the booms are shut off.

Timing:

Apply when the weeds are in the 1-4 leaf stage. Hemp-nettle must be treated before the full 4-leaf stage. Apply when the cereal is in the 2-4 leaf stage.

Application after the 4-leaf stage of cereals can result in severe crop damage especially on sandy soils under good moisture conditions.

Mode of Action:

Linuron is a systemic herbicide which is absorbed through both the foliage and the root system of the plant. Once in the plant, its mode of action is to strongly inhibit photosynthesis. Outward appearance of affected plants is chlorosis (yellowing), stunting, and finally death which occurs in 10-14 days after treatment.

Precautions:

1. DO NOT use when crops are under drought stress.
2. DO NOT use on crops underseeded to forage crops.
3. DO NOT graze or feed green plants to livestock.
4. DO NOT re-treat field with a second application of linuron during the same crop year as injury to the crop may result.
5. DO NOT freeze liquid formulations.
6. DO NOT apply if rain is expected within one hour.

Mixing:

1. When mixing LOROX L with MCPA, the following is recommended:

   (a) Half fill the spray tank with water. (b) With hydraulic by-pass or mechanical agitator operating, slowly pour Lorox L into the tank. (c) Add MCPA. (d) Fill tank to the required water level and spray. Continuous agitation is required.

   Note: Do not leave Lorox L in the spray tank overnight or vigorous agitation with a paddle will be required to resuspend the chemical.
2. Mix LOROX L at 425 mL/ha (170 mL/ac) with TARGET at 1.0-1.5 L/ha (0.4-0.6 L/ac) to control broadleaf weeds in wheat, barley and oats.

amine formulation. Refer to 2,4-D/MCPA section.

Mataven L (flamprop-methyl)

DuPont

Activity: 52.5 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates of Product**
Wheat (durum, winter, spring except Selkirk), triticale, canary seed	5.0 L/ha (2.0 L/ac)
Sunflowers	5.0-6.5 L/ha (2.0-2.6 L/ac). (Use the high rate of application for banding)
Forage Crops Grown for Seed In year of Seeding: Alfalfa, sainfoin, red clover, bird's-foot trefoil, cicer milkvetch	5.0 L/ha (2.0 L/ac)
Bromegrass, meadow fescue, creeping red fescue, Russian wild ryegrass, intermediate wheatgrass, crested wheatgrass	5.0-7.5 L/ha (2.0-3.0 L/ac). (Use the higher rate when grown without a companion crop)

At 5.0 L/ha one 10 litre container treats 2.0 ha (4.9 ac).

Weeds controlled: Wild oats

Application:

Apply in 100 L of water/ha (40 L/ac) at a pressure of 300 kPa (44 psi). Direct the spray pattern 45 degrees forward and adjust boom height to ensure uniform coverage. Optimum results can be expected when applied with flat fan nozzles. DO NOT use flood jet or hollow cone nozzles.

Timing:

Apply when the majority of the wild oats are in the 3-6 leaf stage. Treatment at the 3-4 leaf stage will give the best combination of wild oat control and crop yield response. Do not apply to crop that is past the six leaf stage. Wild oats with less than three leaves will not be controlled.

Mode of Action:

Mataven kills most wild oat plants. Those that survive will be stunted and should not compete with the crop.

Precautions:

1. Thoroughly flush the spray tank and lines with water, before and after using Mataven formulations.
2. Allow an interval of 4 days between the use of Mataven and application of MCPA or Buctril M and an interval of seven days between the application of Mataven and 2,4-D or Banvel.
3. DO NOT graze treated areas.
4. DO NOT store below freezing.
5. DO NOT apply if rainfall is expected within 2 hours.

Mixing:

1. Mix MATAVEN L at 5.0 L/ha (2.0 L/ac) with GLEAN at 15 g/ha for control of wild oats and broadleaf weeds in **spring** and **durum wheat**. Do not apply by air. Add Glean to the spray tank first, followed by Mataven L. Do not add a surfactant. Maintain continuous agitation while filling and spraying. Apply when broadleaf weeds are small and actively growing and when wild oats are in the 3-6 leaf stage.
2. Do not mix with any other pesticides, fertilizers or spray adjuvants.

Mecoturf/Mecoprop 300 (mecoprop) — Rhone Poulenc/United Agri Products

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Activity: 150 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates of Product**
Wheat (spring, durum), oats, barley	5.5-7.0 L/ha (2.2-2.8 L/ac)

Weeds Controlled: Chickweed, corn spurry, cleavers, plantain, volunteer clover and top growth of Canada thistle.

Application:

Apply in 200 L of water/ha (80 L/ac).

Timing:

For best results apply when the weeds are in the 2-4 leaf stage. Mecoprop can be applied safely to cereals from the 3-leaf stage to just before the flag-leaf stage.

Mode of Action:

Similar to 2,4-D and MCPA.

Precautions:

1. DO NOT feed treated fodder to livestock.
2. DO NOT use on cereals underseeded to legumes.
3. Rain shortly after application will reduce effectiveness.
4. DO NOT freeze.

Mixing:

DO NOT mix MECOTURF or MECOPROP 300 with other pesticides, fertilizers or spray adjuvants.

Muster (DPX 7881)* DuPont

Activity: 75% dry flowable

Registered Uses:

Crops	Recommended Rate of Product
Canola	20-30 g/ha (8-12 g/ac)

At 20-30 g/ha one 320 g container treats 16-10.7 ha (40-26 ac).

Weeds Controlled:
At 20 g/ha (8 g/ac): Wild mustard, hemp-nettle, flixweed (spring seedlings) and suppression of stinkweed and green smartweed. At 30 g/ha (12 g/ac): the above weeds plus the suppression of redroot pigweed.

Application:

1. Add Muster to the necessary volume of water in the spray tank with the agitator running. Apply in a minimum of 100 L/ha (40 L/ac) spray volume. Continuous agitation is required.
2. A surfactant (Agsurf, Agral 90 or Citowett Plus) must be used. Add surfactant as the last ingredient at the rate of 2 L per 1000 L of spray mixture. Antifoaming agents may be needed.
3. Apply with ground equipment only. Use a properly calibrated sprayer that will ensure thorough coverage and a uniform spray pattern. Flat fan nozzles are recommended. Use 50 mesh screens or larger.

Timing:

1. Apply when the crop is in the 2-leaf stage to the beginning of bolting. Do not apply prior to this stage as severe crop injury can occur on canola if Muster is applied during crop emergence. Best results are obtained when applied at the cotyledon to 6-leaf stage of the target weeds, and when these weeds are young and actively growing. Apply before the crop canopy prevents thorough coverage of the weeds. Weeds that emerge after treatment will not be controlled.
2. Apply to stinkweed in the 1-4 leaf stage.

Mode of Action:

Muster rapidly inhibits the growth of susceptible weeds, however, symptoms (discoloration) may not be noticeable for 1 to 3 weeks after application, depending on weed sensitivity, weed size, growing conditions, and spray coverage.

Precautions:

1. **Some naturally occurring populations of certain weeds listed above may not be controlled by Muster, Ally, Glean or Refine. These populations are able to survive a use rate several times higher than needed to control susceptible populations. To delay selection for resistant populations, rotate the use of Muster, Ally, Refine or Glean with other herbicides effective on the same weeds. DO NOT use Muster, Ally, Refine, Triumph Plus or Glean repeatedly on the same field.**

   For further information regarding weed resistance to herbicides refer to page 9.
2. DO NOT seed any crop into Muster treated fields in the year of treatment. Growers may not reseed any crop should the Muster-treated canola be lost due to wind, insect or frost damage.
3. Use spray preparation within 24 hours or product degradation may occur. If spray preparation is left standing thoroughly agitate and suspend the mixture before spraying.
4. DO NOT apply, drain or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend, or in locations where the chemical may be washed or moved into contact with their roots.
5. DO NOT graze or feed crop to livestock within 60 days of treatment. DO NOT harvest within 60 days of treatment.
6. DO NOT apply if rainfall is expected within 6 hours.
7. DO NOT apply by aircraft. DO NOT apply or allow drift onto desirable plants or non-target land areas, cropland, water, irrigation or drainage ditches.
8. Immediately after spraying and prior to spraying other crops thoroughly remove all traces of Muster from mixing and spray equipment to avoid possible injury to other crops.
   - (a) Drain tank then flush tank, boom and hoses with clean water for a minimum of 10 minutes.
   - (b) Fill tank with clean water, then add 1 litre household ammonia (containing a minimum 3% ammonia) per 100 litres of water. Flush solution through boom and hoses, then allow to sit for 15 minutes with agitation; then drain. Note: DO NOT use chlorine bleach with ammonia.

(c) Repeat step (b).

(d) Nozzles and screens should be removed and cleaned separately. To remove traces of chlorine bleach, rinse tank thoroughly with clean water and flush through hoses and boom.

9. DO NOT apply Muster to a canola crop that is stressed by severe weather conditions such as drought, low fertility, saline soils, water logged soils (soils at or near field capacity), disease or insect damage as crop injury may result. Drought, disease or insect damage following application also may result in crop injury.
10. DO NOT apply to canola undersown with legumes or grasses as injury to the forage may result.
11. Overspray or drift to important wildlife habitats such as shelterbelts, wetlands, sloughs and dry slough borders, woodlots, vegetated ditchbanks and other cover on the edges of fields should be avoided. Leave a 15 m buffer zone between the last spray swath and the edge of any of these habitats.
12. Whenever Muster is used on land previously treated with Glean or Ally read the rotational guidelines on all labels and follow the one with the longest interval stated for your situation.
13. DO NOT exceed a total of 30 g/ha (12 g/ac) per crop year.
14. DO NOT use on highly variable soils that have large gravelly or sandy areas, eroded knolls, or calcium deposits.
15. SEE LABEL FOR DETAILED PRECAUTIONS AND FOLLOW ALL LABEL DIRECTIONS.

Mixing:

1. Mix MUSTER at the required rate with POAST at 0.8 to 1.9 L/ha (0.32-0.77 L/ac) to control grassy and broadleaf weeds in **canola**. When preparing the combination first add the required amount of Muster to the tank of clean water. Once Muster is in suspension add the required amount of Poast, followed by the correct amount of Assist oil concentrate as stated on the Poast label. Follow the timing restrictions and specific weed control recommendations stated on each label.

The following recropping and rotation intervals should be observed after using Muster unless a successful field bioassay has been completed. The minimum recropping or rotation interval is from the time of last application to the anticipated date of planting.

INTERVAL PRIOR TO PLANTING
(MONTHS AFTER APPLICATION)

10 months - Spring Wheat, Durum Wheat, Barley, Oats, Flax

22 months - Canola, Lentils, Peas, Fababeans, Tame Mustard

All other crops field bioassay at 22 months.

IMPORTANT - Land previously treated with Muster at 20-30 g/ha cannot be rotated to crops other than those listed until a field bioassay confirms that residues of Muster are not present. A field bioassay involves growing test strips of the crop(s) intended for production the following year in fields previously treated with Muster. Crop response will indicate whether or not to rotate to the crop(s) used in the test strip. See Field Bioassay section of the label. Failure to follow these instructions could result in injury to subsequent crops.

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* This product has a temporary registration. Additional technical information is required in relation to its use. Be advised that the current label may be revised. Directions for use and cautionary statements should be carefully followed.

Pardner (bromoxynil) — Rhone Poulenc

Activity: 280 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates of Product**
Wheat (spring, durum, winter), barley, oats, triticale, fall rye	1.0-1.2 L/ha (0.40-0.50 L/ac)
Canary seed	1.0 L/ha (0.40 L/ac)
Seedling grasses sown for seed production in year of establishment only (bromegrass, timothy, slender wheatgrass, creeping red fescue, reed canarygrass, crested wheatgrass, orchard-grass, tall wheatgrass, intermediate wheatgrass, Russian wild ryegrass and meadow fescue)	1.0-1.2 L/ha (0.40-0.50 L/ac)

At 1.0 - 1.2 L/ha two 8 litre contianers treat 16.0-13.3 ha (39.5-33.0 ac).

Weeds controlled: Wild buckwheat, tartary buckwheat, lady's-thumb, green smartweed, cow cockle, kochia, common groundsel, knawel, Russian thistle, stinkweed, lamb's-quarters, wild mustard, redroot pigweed, night-flowering catchfly, scentless chamomile (seedling only), common ragweed, American nightshade.

Application:

Apply in 100 L of water/ha (40 L/ac) at a pressure of 275 kPa (40 psi). Continuous agitation is required.

Timing:

1. Bromoxynil can be safely applied to cereals from the 2-leaf stage until the appearance of the flag-leaf and to flax when the crop is 5-10 cm tall (2-4 in.). Treat canary seed at the 3-5 leaf stage. Best results are obtained from applications made at the early leaf stages.
2. Apply when seedling grasses are in 2-4 leaf stage. Apply to grasses in the year of establishment only, not underseeded to a legume.
3. Apply when broadleaf weeds are in the 1-4 leaf stage. Stinkweed and wild mustard must be sprayed at a very early stage for optimum control.

Mode of Action:

Bromoxynil is a contact herbicide. Therefore, thorough coverage of the weeds is required for good control.

Precautions:

1. DO NOT apply bromoxynil or mixtures containing bromoxynil during hot, humid weather as temporary leaf scorch may result.
2. DO NOT apply if rainfall is expected within 30 minutes.
3. DO NOT graze or harvest for feed within 8 weeks of application.

Mixing:

1. Mix PARDNER at recommended rates with AVENGE 200-C at 3.5-4.25 L/ha (1.40- 1.70 L/ac) to control broadleaf weeds in **barley** and those varieties of **wheat** (spring, durum), registered for Avenge 200-C. Apply in 100 L of water/ha (40 L/ac) when the wild oats are in the 3-5 leaf stage. Add bromoxynil at start of filling then fill tank to 3/4 full and add AVENGE 200-C. Top off spray tank with remaining water.
2. Mix PARDNER at the low recommended rate with MCPA at 0.56-0.84 L/ha (0.23-0.34 L/ac) to control a wide range of broadleaf weeds in **wheat, oats** and **barley**. Cereal crops can be treated safely from the 2-leaf up to the flag leaf stage. Add MCPA to water first. To control hemp-nettle mix with MCPA at 1.12 L/ha (0.45 L/ac).
3. Mix PARDNER at the low recommended rate with:

   (a) 2,4-D Amine at 0.56 L/ha (0.23 L/ac) or

   (b) 2,4-D LV Ester (600 g active ingredient/L) at 0.47 L/ha (0.19 L/ac) for broadleaf weed control in **wheat** and **barley. Do not apply the tank-mix with 2,4-D prior to the 4-leaf stage of the crop.**
4. Mix PARDNER at the low recommended rate with HOE-GRASS at 2.8 L/ha (1.13 L/ac) to control grassy and broadleaved weeds in **spring wheat** and **barley (except Betzes,**

Norbert, Klages). Apply in 100 L of water/ha (40 L/ac) at a pressure of 275 kPa (40 psi). Apply when the weeds are in the 1-3 leaf stage and before the grassy weeds have tillered. Do not apply to barley after the 4-leaf stage or more than 21 days after crop emergence. During periods of stress (i.e. very very hot (28 C) and/or dry conditions or low humidity) plants are not actively growing. Better control of grassy weeds will be achieved if Hoe-Grass is applied alone rather than as a tank-mix with bromoxynil under these conditions.

5. Mix PARDNER at 1.0 L/ha (0.40 L/ac) with MCPA at 0.56 L/ha (0.23 L/ac) and TCA to control broadleaf weeds and green foxtail in **barley** and **oats**. Refer to TCA section for recommended rates of application for TCA formulations. Apply in 100-150 L water/ha (40-60 L/ac) when the crop is in the 2-4 leaf stage. Add MCPA to the thank first then Pardner, and finally TCA. Keep well agitated during mixing and application. This treatment may cause leaf burn and retarded crop growth, particularly under adverse growing conditions.

Poast (sethoxydim) **BASF**

Activity: 184 g active ingredient/litre

Registered Uses:

Crops

Canola (including triazine tolerant canola), flax, peas, lentils, tame buckwheat, fababeans, dry beans (White, kidney, pinto), alfalfa (seedling or established, seed or forage) and for seed (seedling or established); alsike clover, cicer milkvetch, sainfoin, sweet clover, creeping red fescue

Recommended Rates of Product and Weeds Controlled:

At 0.8 L/ha (0.32 L/ac): Green and yellow foxtail (wild millet), barnyard grass, volunteer corn, proso millet, witch grass, and Persian darnel.
At 1.0 L/ha (0.40 L/ac): For extremely heavy infestations of the above annual grasses.
At 1.4 L/ha (0.57 L/ac): Wild oats plus all of the above annual grasses.
At 1.6 L/ha (0.65 L/ac): For extremely heavy infestations of Wild oats and the above annual grasses.
At 1.4 L/ha (0.57 L/ac) + BASF Power Pack * or at 1.6 L/ha (0.65 L/ac): For volunteer wheat, volunteer oats, and volunteer barley plus all of the above noted grasses.
At 1.9 L/ha (0.77 L/ac): For extremely heavy infestations of volunteer cereals and above noted grasses.
**At 2.7 L/ha (1.08 L/ac + BASF Power Pack *: For quackgrass top growth and all the above noted grasses.
* BASF Power Pack contains 2 x 10.6 L of Liquid Ammonium Sulphate and 1 x 3.4 L of Assist Oil Concentrate. 1 Case of Poast with 2 Power Packs treats 24.7 acres at the Volunteer Cereals rate. 1 Case of Poast with 1 Power Pack treats 12.8 acres at the Quackgrass rate.
**2.7 L/ha + BASF Power Pack not for use on dry peas or tame buckwheat.

Application:

1. Apply post-emergence in 50-100 L/ha (20-40 L/ac) of water at a minimum 240 kPa (35 psi) pressure with 0.5 to 1.0 L/ha (0.2-0.4 L/ac) of Assist or Merge for annual grasses and 2.0 L/ha (0.81 L/ac) of Assist or Merge for quack grass. In applications to dense weed infestations or to dense crop canopies, use 100 to 200 L/ha (40-80 L/ac) of water at pressures of 275 to 425 kPa (40-60 psi) with 1.0-2.0 L/ha (0.4-0.8 L/ac) of Assist or 1 L/ha (0.4 L/ac) of Merge for annual grasses and 2-4.0 L/ha (0.8-1.6 L/ac) of Assist or 2 L/ha (0.8 L/ac) of Merge for quack grass.
2. Use 80 or 110 degree stainless steel flat fan nozzles angled forward at 45 degrees to ensure better coverage.
3. Poast may be applied by air in 25-50 L/ha (10-20 L/ac) of water in pressures up to 200 kPa (30 psi). Care should be taken to prevent drift to nearby sensitive cereal and other grass crops.
4. Refer to label for maximum rate of application recommended for each crop.

Timing:

1. Poast is tolerated by all stages of the crop.
2. Apply Poast when wild oats, foxtails, volunteer cereals and other annual grasses are in the 1-6 leaf stage. Most effective control is at the 2-5 leaf stage of the grasses, when the crop is still small enough to permit thorough coverage to the grasses. Quack grass should be sprayed in the 1-3 leaf stage.

Late application and/or poor growing conditions may result in reduced control of grassy weeds.

Mode of Action:

Poast is a contact and systemic herbicide. Uptake is primarily through the leaves and thorough coverage of the foliage is important for consistent grass control. Susceptible annual grasses stop growing and slowly turn brown. Complete control takes 7-21 days. Top growth control of quack grass, in crop, can be expected for at least 6 to 8 weeks. Some underground buds dormant at the time of application may regrow later in the season. Crop competition will help keep regrowth to a minimum until harvest.

Precautions:

1. DO NOT apply if rainfall is expected with 1 hour.
2. Allow 4 days between applications of Poast and any other pesticide.
3. DO NOT graze treated fields or harvest for feed prior to crop maturity.
4. When grasses are stressed due to drought, flooding or prolonged cool temperatures (15 C or less), control can be reduced or delayed. Delaying application until better conditions prevail may be advisable.
5. Avoid causing spray drift to susceptible cereal or grass crops.
6. DO NOT spray quack grass rates by air.
7. DO NOT apply Poast plus broadleaf tank mixes by air.

8. DO NOT apply Poast plus BASF Ammonium Sulphate by air.
9. DO NOT use BASF Ammonium Sulphate with any broadleaf weed herbicide and POAST tank mixes or if Merge is used as the surfactant.
10. Apply Poast in a thoroughly clean sprayer.
11. Immediately after use, thoroughly clean the sprayer by flushing the system with water containing detergent. (A Poast plus Assist mix will be satisfactorily cleaned by using household ammonia. Other precautions should be used, depending on broadleaf compound used).
12. BASF Ammonium Sulphate can be corrosive to galvanized sprayer parts, therefore thorough cleaning after use is essential.
13. All research work was done with BASF Ammonium Sulphate. BASF Ammonium Sulphate is a liquid form of technical grade 21-0-0-24 and should not be confused with the prelled fertilizer grade. The fertilizer grade may not give the same quality of results as can be expected with the technical grade.
14. Poast in combination with Merge is not registered for use on forage legumes grown for seed.

Mixing:

When mixing POAST the following is recommended. Half fill the spray tank with water and start continuous agitation. Agitation should be running during the entire mixing procedure. Add the broadleaf herbicide or BASF Ammonium Sulphate if required, add the correct amount of Poast, add the correct amount of Assist Oil Concentrate or Merge. Fill tank to required water level and spray. Continuous agitation is required. Avoid allowing spray mixture to sit overnight. The following mixtures may result in some crop injury, delayed maturity and/or some reduced grass control. **DO NOT use BASF Ammonium Sulphate with any broadleaf weed herbicide and Poast tank mixes.**

1. Mix POAST at the required rate (maximum 1.9 L/ha) with BUCTRIL-M at 1.0 L/ha (0.40 L/ac) to control grassy and broadleaf weeds in **flax**. Apply in a minimum 100 L of water/ha (40 L/ac) when grass weeds are in the 2-5 leaf stage and flax is 5-10 cm (2-4 in.) tall. Rates of Assist Oil Concentrate greater than 1.0 L/ha (0.4 L/ac) may result in increased flax injury.
2. Mix POAST at the required rate (maximum 1.9 L/ha) with MCPA (amine or ester) up to 1.1 L/ha (0.45 L/ac) to control grassy and broadleaf weeds in **flax**. Apply after the **flax** is 5 cm (2 in.) tall and before bud formation.
3. Mix POAST at the required rate (maximum 1.9 L/ha) with BLADEX Liquid at 3.0 L/ha (1.2 L/ac) to control grassy weeds and broadleaf weeds in **triazine tolerant canola**. Apply when grassy weeds are in the 1-6 leaf stage and broadleaf weeds are in the 1-4 leaf stage, no later than the 4-leaf stage of the crop.
4. Mix POAST at the required rate (maximum 1.9 L/ha) with LONTREL at 1.0-1.5 L/ha (0.4-0.6 L/ac) to control grassy weeds and some broadleaf weeds in **canola**. Apply when grassy weeds are in the 2-5 leaf stage and Canada thistle is greater than 10 cm (4 in.) tall. The canola should be in the 3-6 leaf stage. Poast CT is a prepackaged split-jug design that contains 5.6 L of Poast and 3.0 L of Lontrel. The package also includes Assist or Merge. Poast CT is recommended for use on **canola** and will treat 10 acres.
5. Mix POAST at the required rate (maximum 1.9 L/ha) with MUSTER at 20-30 g/ha (8-12 g/ac) to control annual grassy and broadleaf weeds in **canola**. Apply to canola in the 2-leaf to the beginning of bolting when the weeds are young and actively growing. When preparing the combination first add the required amount of Muster to the tank of clean water. Once the Muster is in suspension add the required amount of Poast and Ammonium Sulphate (if required), followed by the correct amount of Assist Oil Concentrate.

Princep Nine-T/Simazine 80W (simazine) — Ciba-Geigy/United Agri Products

Activity: Princep Nine-T 90% water dispersible granule
Simazine 80W 80% wettable powder

Registered Uses:

Crops	Recommended Rates of Product
Established alfalfa, bird's-foot trefoil	1.1 kg/ha (0.45 kg/ac) Princep Nine-T 1.5 kg/ha (0.6 kg/ac) Simazine 80W

At 1.1 kg/ha one 1.5 kg container treats 1.4 ha (3.5 ac).
At 1.5 kg/ha one 2.0 kg container treats 1.3 ha (3.3 ac).

Weeds controlled: Lady's-thumb, lamb's-quarters, purslane, ragweed, volunteer clover, wild buckwheat, smartweed, barnyard grass, wild oats, green foxtail.

Application:

1. Gentle agitation is required during mixing and spraying of the water dispersible granule. Use nozzle screens of 50 mesh size or larger. After any break in the spray application, agitate thoroughly.
2. Apply in 300 litres of water/ha (120 L/ac).

Timing:

Apply in fall from September to freeze-up.

Mode of Action:

Princep acts through the roots of germinating weeds and inhibits photosynthesis.

Precautions:

1. DO NOT graze for 30 days or harvest for 60 days.
2. DO NOT plant any other crop into treated area, soil residues may persist for 2 or more years.
3. DO NOT overlap application.
4. DO NOT apply to the same field for more than 3 consecutive years.
5. DO NOT apply gramoxone within one year after the application.

Mixing:

DO NOT tank-mix PRINCEP NINE-T or SIMAZINE 80W with any other herbicides, fertilizers or spray adjuvants.

Refine (thifensulfuron)* DuPont

Activity: 75% dry flowable

Registered Uses:

Crops	**Recommended Rate of Product**
Wheat (spring, winter or durum), barley, oats	20 g/ha (8 g/ac)

At 20 g/ha one 320 g container treats 16 ha (40 ac).

Weeds Controlled: Chickweed, hemp-nettle, lady's-thumb, redroot pigweed, corn spurry, Russian thistle, green smartweed, stinkweed, lamb's-quarters, volunteer canola, cow cockle, wild buckwheat, wild mustard.

Weeds Suppressed: Kochia.

Application:

1. Add the proper amount of Refine into the necessary volume of water in the spray tank with the agitator running. Prepare the mixture to use a minimum of 100 L/ha (40 L/ac) spray volume. Continuous agitation is required for a uniform suspension and application.
2. A recommended surfactant (Agsurf, Agral 90, Super Spreader or Citowett Plus) must be used when applying Refine. Add surfactant as the last ingredient at the rate of 2 L per 1000 L of spray volume. Antifoaming agents may be needed.
3. Apply the spray mixture with ground equipment only. Use a properly calibrated sprayer that will ensure thorough coverage and a uniform spray pattern. Flat fan nozzles are recommended. When using flood jet or "raindrop" nozzles, apply 225 L/ha (90 L/ac) total spray volume to ensure thorough coverage. Use 50 mesh screens or larger.

Timing:

1. Apply in the spring when the crop is in the 2-leaf to flag-leaf stage. Best results are obtained when applied to small and actively growing weeds less than 10 cm (4 in.) tall or across. Apply before the crop canopy prevents thorough coverage of the weeds. Weeds that emerge after treatment will not be controlled.
2. Apply to chickweed when the chickweed is small (1 to 6 leaf) and actively growing but before crop canopy prevents thorough coverage of weeds.
3. Apply to wild buckwheat when in the cotyledon to 3-leaf stage and when lamb's-quarters or Russian thistle are no larger than 8 cm (3 in.) tall.

Mode of Action:

Refine rapidly inhibits the growth of susceptible weeds, however, typical symptoms (discoloration) of dying weeds may not be noticeable for 1 to 3 weeks after application, depending on growing conditions and weed susceptibility. Favourable growing conditions following treatment promotes the activity of Refine while cold, dry conditions delay the activity.

Precautions:

1. **Some naturally occurring populations of certain weeds listed above will not be controlled by Refine, Ally, Muster, Triumph Plus or Glean. These populations are able to survive a use rate severals times higher than needed to control susceptible populations. To delay selection for resistant populations, rotate the use of Refine, Ally, Muster, Triumph Plus and/or Glean with other herbicides effective on the same weeds. DO NOT use Refine, Ally, Muster, Triumph Plus or Glean repeatedly in the same field. Recommended tank mixtures of Refine, and MCPA will also help delay the selection for resistant populations of weeds that are normally controlled or suppressed by both herbicides (see tank-mix section). For further information regarding weed resistance to herbicides refer to page 9.**
2. Use spray preparation of Refine within 24 hours or product degradation may occur. If spray preparation is left standing thoroughly agitate and suspend the mixture before spraying.
3. DO NOT apply, drain or flush equipmment on or near desirable trees or other plants, or on areas where their roots may extend, or in locations where the chemical may be washed or moved into contact with their roots.
4. DO NOT graze or harvest for livestock feed within 7 days of application.
5. DO NOT apply if rainfall is expected within 6 hours.
6. DO NOT apply by aircraft. DO NOT apply or allow drift onto desirable plants or non-target land areas, cropland, water, irrigation or drainage ditches.

7. Immediately after spraying and prior to spraying other crops thoroughly remove all traces of Refine from mixing and spray equipment to avoid possible injury to other crops.
    (a) Drain tank then flush tank, boom and hoses with clean water for a minimum of 10 minutes.
    (b) Fill tank with clean water, then add 1 litre household ammonia (containing 3% ammonia) per 100 litres of water (1.0% by volume). Flush through boom and hoses then allow to sit for 15 minutes with agitation; then drain. NOTE: DO NOT use chlorine bleach with ammonia.
    (c) Repeat step b.
    (d) Nozzles and screens should be removed and cleaned separately. To remove traces of chlorine bleach, rinse tank thoroughly with clean water and flush through hoses and boom.
8. DO NOT apply to wheat, barley or oats that are stressed by severe weather conditions, frost, low fertility, drought, water saturated soil, disease or insect damage as crop injury may result.
9. Under certain conditions (such as heavy rainfall, prolonged cool weather, frost conditions, wide fluctuations in day/night temperatures) temporary lightening in crop colour and occasionally a slight reduction in crop height may occur.
10. DO NOT apply to crops underseeded to legumes, or grasses as injury to forage may result.
11. Because crop varieties differ in their tolerance to herbicides, limit first use of Refine to a small area of each variety prior to adoption as a field practice.
12. DO NOT exceed a total of 20 g/ha per crop year.
13. SEE LABEL FOR DETAILED PRECAUTIONS AND FOLLOW ALL LABEL DIRECTIONS.
14. DO NOT plant to any crop other than wheat or barley for 30 days after application.

Mixing:

1. Mix REFINE at 20 g/ha with MCPA Amine 500 at 1.0 L/ha (0.4 L/ac) for control of the above weeds plus ragweed and suppression of Canada thistle in **wheat** (spring, winter, durum), **barley** or **oats**. Add a recommended surfactant at the rate of 2 L/1000 L of spray volume. FOLLOW ALL PRECAUTIONARY STATEMENTS FOR PRODUCTS USED.
2. Mix REFINE at 20 g/ha with Hoe-Grass at 2.5-2.8 L/ha (1.0-1.13 L/ac) for the control of certain annual broadleaf weeds and **wild oats only** in **wheat** (spring, winter, durum) and **barley** (except Klages, Norbert and Betzes). DO NOT ADD A SURFACTANT. This tank-mix does not control green or yellow foxtail, Persian darnel, barnyard grass, or volunteer corn. Consult the Hoe-Grass label for additional application instructions and use precautions. Apply to broadleaf weeds that are young and actively growing. Ensure that Refine is completely in suspension in the spray tank before adding Hoe-Grass. On repeat tank loads, prepare a Refine/water slurry and add it to the required water volume in the spray tank prior to adding Hoe-Grass.
3. Mix REFINE at 20 g/ha with AVENGE 200-C at 4.25 L/ha (1.7 L/ac) to control wild oats and broadleaf weeds in **barley** and those varieties of **wheat** registered for Avenge 200-C. Do not use this tank-mix during periods of stress (i.e. dry conditions, low humidity or when plants are not actively growing) since applications under these conditions may result in significantly reduced wild oat control. Ensure that Refine is completely in suspension in the spray tank before adding Avenge 200-C. DO NOT ADD A SURFACTANT. On repeat tank loads, prepare a Refine/water slurry and add it to the required water volume in the spray tank prior to adding Avenge.

* This product has a temporary registration. Additional technical information is required in relation to its use. Be advised that the current label may be revised. Directions for use and cautionary statements should be carefully followed.

Reglone (diquat) **Crop Desiccation** **ICI Chipman**

Activity: 200 g active ingredient/litre

Registered Uses	**Recommended Rates of Product**	
Crops	**Ground Application**	**Aerial Application**
Flax, mustard, sunflower, canola (Polish type only)	1.5-2.0 L/ha (0.6-0.8 L/ac)	2.0-2.75 L/ha (0.8-1.1 L/ac)
Peas, lentil	1.5-2.0 L/ha	1.5-2.75 L/ha
Alfalfa	1.5-2.0 L/ha	Not Recommended
Dry Beans	1.5-2.0 L/ha[1]	2.0 L/ha

In light stands or fields free of weeds apply the lower recommended rate of application; use the higher rate in heavy stands or fields that contain weeds.

In sparse, non-uniform stands apply 1.5 L/ha (0.6 L/ac); in normal stands with few weeds apply 2.0 L/ha (0.8 L/ac); and in heavy stands or fields that contain weeds apply 2.75 L/ha (1.1 L/ac).

Application:

1. Apply by ground in 225-550 L water/ha (90-220 L/ac) and by aircraft in at least 45 L of water/ha (18 L/ac). Add Agral 90 at a rate of 1 L per 1000 L (0.1%). Sprayer pressure of 200-300 kPa (30-45 psi) should be used for ground sprayers and 150-200 kPa (20-30 psi) for aircraft.
2. Ground application will permit use of higher water volumes and provide more complete coverage. Aerial application may be used when the crop is too dense or the ground too soft for ground rigs. For further information on aerial application, refer to the Guide for Aerial Application of Reglone.

Timing:-

Canola (Polish type only): Spray when the crop is at the 60-75% seed turn (green to brown) stage. Do not treat when the crop is immature or past the recommended stage of maturity. Commence combining no later than 14 days after treatment. Germination of seed is not affected by this treatment.

Sunflowers (Oil and Confectionery): Spray when the seeds reach maturity (20-50% moisture in the seed and hull). The back of the heads should be yellow. Germination of the seed is not affected by this treatment. Do not apply when the crop is immature or past the recommended stage of maturity. Commence combining 15-20 days after spraying.

Peas: Spray when the crop has reached maturity. This treatment does not mature peas. Germination of seed is not affected by this treatment. Commence combining when the peas test dry.

Flax: Spray when the crop is at the 75% boll turn stage (normal swathing time). Do not apply when the crop is immature. Combine when the flax seed tests dry. Germination of seed is not affected by this treatment.

Mustard: Spray when the crop is at the 75% seed turn (green to brown) stage. Do not apply when the crop is immature or past the recommended stage of maturity. Pod and stem kill takes place in 7-10 days after application and eliminates the need to swath. Desiccation also allows the delaying of swathing until just before combining, thus reducing the risk of losses due to blowing swaths. Commence combining no later than 14 days after treatment. Germination of seed is not affected by this treatment.

Lentil: Spray at the time swathing would normally commence. This is when the lower most pods are yellow-brown and rattle. Commence combining when lentils test dry. Under ideal drying conditions, harvest may commence in 4-7 days. When pods are mature, yet green tissue remains in the bottom of the crop, use higher water volumes.

Alfalfa (seed crop): Spray by ground only when the seed is mature (75% of seed yellowed and hard). To prevent seed pods from shattering and subsequent loss of seed, interval between application and harvest should not exceed 7 days. Depending on growing conditions, perennials may begin regrowth in 2-3 weeks. DO NOT use Reglone if a residual herbicide has been used on the alfalfa within the past 12 months.

Dry Beans: Spray when there is 80-90% natural leaf defoliation of bean plants. This treatment does not mature beans nor does it lower the moisture content of beans.

Mode of Action:

Diquat is a non-selective fast acting contact herbicide that interferes with photosynthesis. Application made on cloudy days or just prior to or during periods of darkness will generally increase effectiveness.

Precautions:

1. The use of Reglone to desiccate crop foliage and weed growth can reduce the time from maturity to harvest and reduce harvesting difficulties in many crops. Desiccation does not, however, speed up the maturity of a crop. Treatments should not be applied until the crops have reached maturity. In cases of adverse weather conditions such as heavy rain, hail or strong wind, the resultant crop damage may be enhanced, taking into account that certain crops are more fragile than others.

   Under drought conditions, the higher rate of Reglone will provide more consistent control. If a killing frost is suspected, wait a few days before application to determine whether the plants are still actively growing. Large weeds are more difficult to desiccate, eg. large dense stands of kochia are difficult to thoroughly cover, and their thick stems require more time to dry down. These situations may be better handled by swathing.
2. Avoid spray drift onto adjacent crops, shelterbelts and wildlife cover. DO NOT apply under dead calm or extremely windy conditions, minimal drift is obtained when light winds (3-8 km/h) (2-5 mph) are present.
3. DO NOT use aerial application in fields where wetlands or other good wildlife cover might be oversprayed. Use ground sprayers and leave an unsprayed margin of 15 M (50 ft.) around the border of all sloughs.
4. Apply in clear water.
5. DO NOT apply if rainfall is expected within 30 minutes.

Mixing:

DO NOT tank-mix Reglone with other pesticides, fertilizers or spray adjuvants.

Rival EC, 10 G (trifluralin) **Hoechst**

Activity: Rival EC 500 g active ingredient/litre
Rival 10G 10% granules

Registered Uses:

Crops	Recommended Rates of Product Fall Granular	 Fall Liquid	 Spring Liquid
Canola, triazine tolerant canola, sunflowers, peas, mustard, fababeans	11-14 kg/ha (4.5-5.7 kg/ac)	2.2-2.8 L/ha (0.9-1.1 L/ac)	1.6-2.2 L/ha (0.65-0.9 L/ac)
Safflower	Not Recommended	2.2-2.8 L/ha (0.9-1.1 L/ac)	1.6-2.2 L/ha (0.65-0.9 L/ac)
Flax, lentils	11-14 kg/ha (4.5-5.7 kg/ac)	2.2-2.8 L/ha (0.9-1.1 L/ac)	Not Recommended
Wheat (spring, durum)	Not Recommended	Not Recommended	1.2-1.6 L/ha (0.5-0.65 L/ac)
Barley	8.5-14 kg/ha (3.4-5.7 kg/ac)	Not Recommended	1.2-1.6 L/ha (0.5-0.65 L/ac)
Sweet clover, sainfoin, dry beans (white, kidney)	Not Recommended	Not Recommended	1.6-2.2 L/ha (0.65-0.9 L/ac)

Summer Application:
Flax, triazine tolerant canola, peas, mustard, sunflowers, fababeans and canola only -- 3.4 L/ha (1.4 L/ac), 14.0-17.0 kg/ha (5.7-6.9 kg/ac)

At 11-14 kg/ha one 22.7 kg bag treats 2.1-1.6 ha (5.1-4.0 ac).
At 1.6-2.2 L/ha one 9 litre container treats 5.6-4.1 ha (13.9-10.1 ac).

Weeds Controlled: Wild oats, green and yellow foxtail (wild millet), barnyard grass, wild buckwheat, cow cockle, redroot pigweed, lamb's-quarters, Russian thistle, chickweed, purslane, knotweed, Persian darnel.

Rates recommended for barley and wheat will control green and yellow foxtail (wild millet) only. Use 8.5 kg/ha (3.4 kg/ac) in soils with 2-4% organic matter. Use 11.0 kg/ha (4.5 kg/ac) in soils with 4-6% organic matter. Use 14 kg/ha (5.7 kg/ac) in soils with 6-10% organic matter (except sandy and sandy loam soils).

Application:

1. Apply Rival EC in a minimum of 100 L of water/ha (40 L/ac) at a pressure of 200 to 275 kPa (30-40 psi). Use ground equipment only.
2. For sandy or sandy loam soils with less than 6% organic matter, use the lower rate. All medium to heavy soils (loams and clays) with 6-15% organic matter, use higher rates depending on extent of wild oat infestations.
3. Do not apply to soils which contain more than 15% organic matter, such as peat or muck soils, wet soils that are subject to excessive flooding or soils in poor working condition.
4. All weeds should be eliminated through discing or cultivation before applying Rival. For application to stubble and trashy soils, thoroughly disc soils to ensure crop residues and trash have been mixed into the soil to a maximum depth of 10 cm (4 in.).
5. Do not fall apply Rival to soils subject to erosion by wind, water or other factors. Fall application to summerfallow with low trash cover or light textured soils may predispose field to erosion and is not recommended.

Timing:

Spring - apply and for best results incorporate immediately, in the same operation if possible. Do not delay incorporation more than 24 hours after application. The second incorporation may be done at the time of seedbed preparation provided it is done at the recommended depth.

Summer - apply to summerfallow between June and September 1 and for best results incorporate immediately, in the same operation if possible. Do not delay incorporation more than 24 hours after application. All further incorporations may be done at any time during the fallow season. Shallow till in spring after the soil has warmed.

Fall - apply between September 1 and soil freeze-up. For best results incorporate immediately, in the same operation if possible. Do not delay incorporation more than 24 hours after application. The second incorporation may be done in the fall or spring at the time of seedbed preparation. For Rival 10 G, delay second incorporation for 5 days after first incorporation to allow greater release of product and more effective weed control. A shallow tillage in spring prior to seeding is required if second incorporation is done in the fall.

Incorporation:

For Oilseed and Pulse Crops

Incorporate with disc implements or cultivators only. A tandem disc is recommended for the first incorporation. Do not delay first incorporation more than 24 hours after application. The first incorporation should be in the same direction as application with the second incorporation at right angles to the first. For summer or fall applications, a shallow tillage is required in the spring prior to seeding if both incorporations are done in the fall.

Incorporate to a depth of 8-10 cm (3-4 in.). Disc implements should be operated at 7-10 km/h (4.2-6.2 mph) and cultivators at 8-10 km/h (5-6.2 mph). Deep tillage cultivators, chisel plows, rod weeders, harrows or hoe-drills are not recommended.

Special Instructions for Flax and Lentils:

1. Both incorporations should be done in summer or fall before seeding in the spring. For lentils, apply Rival 10 G or EC in fall only if crop is to be seeded the following spring.
2. A shallow tillage and packing of seedbed in the spring is recommended to ensure a firm seedbed and maintain a constant planting depth.
3. Seed to a depth of 2-4 cm (.8-1.6 in.) into a moist seedbed when soil temperatures are warm (usually after mid-May). Environmental factors which delay crop germination and emergence will increase the risk of damage resulting in a delay in crop maturity and/or reduced yields.

Directions for fall application of Rival 10 G in barley:

1. Do not use barley rates of application in other registered crops.
2. Do not apply Rival 10 G for barley on land treated with Rival, Treflan, Heritage, Advance, Free Flow or Triflurex since June 1 of the previous year.
3. Use varied recommended rates for soils of organic matter up to 10%. Do not apply to soils with more than 10% organic matter or less than 2% organic matter.
4. Application to severely eroded knolls may result in reduced crop stand.
5. Initial incorporation must be within 8 hours of application to a depth of 8-10 cm (3- 4 in.). Second incorporation should also be done in fall at right angles to first, and be delayed for 5 days for maximum weed control effectiveness.
6. Do not seed when soil conditions are cold. Seeding should be done with drills into warm, moist seedbeds. If air seeder or discers are used, avoid variable seeding depth and ensure a firm seedbed by packing after seeding.

For Cereals:

Spring application of Rival in wheat and barley will control green foxtail (wild millet) only. Seed crop in a well prepared seedbed to a depth of 5-8 cm (2-3 in.). Apply Rival EC immediately after seeding and before crop emerges to trash free soil. Two shallow incorporations of 2-4 cm (.8-1.6 in.) with tyne or diamond harrows must be done within 8 hours of application at speeds of at least 8 km/h (5.6 mph) and at right angles to each other. First incorporation should be done in the same direction as application.

Mode of Action:

Rival controls susceptible weeds through the roots as they germinate. It does not control susceptible weeds that have emerged through the soil at the time of application.

Precautions:

1. **Rival will not control trifluralin tolerant green and yellow foxtail (wild millet). Trifluralin tolerant green foxtail populations have built up because trifluralin has been repeatedly used for many years as the major herbicide in a field. Populations of green foxtail tolerant to trifluralin herbicides have appeared in some areas of Saskatchewan. For further information regarding weed resistance to herbicides refer to page 9.**
2. Fall application of Rival is not recommended to soils subject to erosion by wind, water or other factors, to summerfallow with low trash cover, or to a light textured soil which may predispose the field to erosion.
3. DO NOT apply to peat or muck soils, wet soils subject to excessive flooding, soils with more than 15% organic matter, or soils in poor working condition.
4. Highly sensitive crops such as tame oats, canary seed, sugar beets and forage grasses should not be grown in rotation the year after Rival application.
5. A risk of damage to treated crops from Rival may result if factors such a deep planting, excessive moisture, cold temperatures, seedling disease, poor soil fertility, drought or saline soils weaken crop emergence. A delay in crop maturity and/or reduced yields may result.

6. Crop injury to wheat may result in the second year of a crop rotation following dry soil conditions during the first crop year after Rival 10 G is used. To reduce injury to wheat, seed the crop shallow when a warm, moist seedbed is present.
7. Avoid concentrating Rival 10 G in narrow bands. Use properly calibrated granular application for uniform application to soil surface.
8. Injury to wheat and barley may occur if seeded into a deeply incorporated layer of Rival.
9. If Rival EC is frozen, bring the contents to 15 C for 24 hours and shake well before using.
10. If manure is applied to field, thoroughly mix with 2 tillage operations before applying Rival. Fields that have been burned for trash management should be tilled once before Rival is applied.
11. DO NOT use a moldboard plough before Rival application.
12. DO NOT store Rival 10 G under direct sunlight.
13. DO NOT store in granular applicators for more than 24 hours.
14. There are no grazing restrictions.

Mixing:

1. Mix RIVAL EC at 1.2 L/ha (0.5 L/ac) on light and medium soils and at 1.6 L/ha (0.65 L/ac) on heavy soils with AVADEX BW at 3.5 L/ha (1.40 L/ac) in **wheat** and 4.25 L/ha (1.70 L/ac) in **barley** for wild oat and green foxtail control. Apply immediately after seeding and before crop emerges. Double incorporate at right angles to a depth of 2-4 cm (.8-1.6 in.) within 8 hours of application. Incorporation must be above the depth of seed placement.
2. Mix RIVAL at 1.6-2.2 L/ha (0.65-0.9 L/ac) for spring application in oilseed and special crops and at 1.2-1.6 L/ha (0.5-0.65 L/ac) in wheat and barley with liquid nitrogen fertilizer (eg. 28-0-0). For wheat and barley, Rival and liquid nitrogen fertilizer may also be mixed with Avadex BW. Follow incorporation instructions, application timing and cautions for normal Rival application, as per registered crop. To test Rival's compatibility with liquid fertilizer add 500 mL of liquid fertilizer and 10 mL of Rival to a container and shake well. If Rival remains in suspension for 5 minutes or longer, the two are compatible. If Rival settles out, but can be resuspended quickly by shaking, the mixture may be used, but constant and vigorous agitation will be required before and during application.
3. Mix Rival EC with Sencor 500 or Sencor 75 DF for grassy and broadleaf weed control, including stinkweed and wild mustard, in **triazine tolerant canola**. Apply in fall or before planting in spring and incorporate immediately according to Rival recommendations.
   (a) For spring application mix Rival EC at 1.6 L/ac (0.65 L/ac) with Sencor 500 at 425-550 mL/ha (170-220 mL/ac) or Sencor 75DF at 275-375 g/ha (110-150 g/ac) on light soils with less than 6% organic matter. On medium or heavy soils with 6-15% organic matter apply Rival EC at 2.2 L/ha (0.9 L/ac) with Sencor 500 at 550-850 mL/ha (220-340 mL/ac) or Sencor DF at 375-550 g/ha (150-220 g/ac).
   (b) For fall application mix Rival EC at 2.2 L/ha (0.9 L/ac) with Sencor 500 at 550 - 700 mL/ha (220 - 280 mL/ac) or Sencor 75 DF at 375-475 g/ha (150-190 g/ac) on soils with less than 6% organic matter. On medium to heavy soils with 6-15% organic matter apply Rival EC at 2.8 L/ha (1.1 L/ac) with Sencor 500 at 700-850 mL/ha (280-340 mL/ac) or Sencor 75 DF at 475-550 g/ha (190-220 g/ac).

   Always add Sencor to the spray tank first. Continuous agitation is required throughout the mixing and spraying operations. FOLLOW ALL LAND PREPARATION, MIXING, SPRAYING, INCORPORATION DIRECTIONS AND PRECAUTIONS AS OUTLINED ON THE SENCOR AND RIVAL LABELS. THIS TANK-MIX IS FOR USE ONLY ON TRIAZINE TOLERANT CANOLA. NON-TRIAZINE TOLERANT CANOLA WILL BE KILLED BY THIS TANK-MIX.

   Note: Sencor rate varies with soil organic matter; the higher the organic matter the higher the rate of Sencor required. Refer to Sencor section or label for details.
4. Rival EC may be mixed with liquid nitrogen fertilizer (eg. 28-0-0) for application. Dry bulk fertilizer (except nitrate fertilizers) may be impregnated with Rival EC. Refer to product label for instructions.

   Note: Speeds in excess of 8 km/h (5 mph) will result in excessive pulverization and trash reduction leaving fields susceptible to erosion. The maximum recommended tillage depth for Saskatchewan is 10 cm (4 in.). Fall application is not recommended where a lack of trash cover combined with the required incorporation could result in soil erosion.

Rival 10 G For Use On Summerfallow Or Stubble Followed By Wheat In Rotation

Registered Uses:

Crop	Date of Application	Recommended Rates of Product Sand/Sandy Loam 1-3% O.M.	4-8% O.M.
Wheat (spring, durum)	May	9.5 kg/ha (3.8 kg/ac)	11.0 kg/ha (4.4 kg/ac)
	June	8.0 kg/ha (3.2 kg/ac)	9.5 kg/ha (3.8 kg/ac)
	July	6.5 kg/ha (2.6 kg/ac)	8.0 kg/ha (3.2 kg/ac)
		2-8% O.M.	
	Sept.-Oct.	5.5 kg/ha[4] (2.2 kg/ac)	

Weeds Controlled: Fallow year - Wild oats, green and yellow foxtail (wild millet), barnyard grass, Persian darnel, lamb's-quarters, Russian thistle, redroot pigweed, cow cockle, wild buckwheat.

Crop Year - Green and yellow foxtail (wild millet), lamb's-quarters, wild oats , wild buckwheat .

Do not fall apply Rival 10 G to stubble if the land was treated with Rival, Treflan, Heritage, or Triflurex in either the current year or the previous crop year.

During the fallow year, susceptible weeds will not be fully controlled until after the second incorporation, when a uniform layer of soil treated with Rival 10 G is established.

During the crop year, some wild oats and wild buckwheat may escape the Rival 10 G herbicidal action depending on weed population as well as soil and climatic conditions. However, crop competition will usually effectively suppress the escaped weeds so that little or no competition results with the crop.

[4] Control of green foxtail (wild millet) only.

Rival 10 G can be incorporated into the soil during the summerfallow year to control several weeds during both years of the summerfallow-wheat rotation.

Application and Timing:

1. DO NOT apply to sandy soils with less than 1% organic matter. Application to severely eroded knolls is not recommended because wheat injury may occur.
2. DO NOT apply to wet soils, soils in poor working condition, soils which contain greater than 8% organic matter, or soils subject to prolonged periods of flooding.
3. Rival 10 G may be applied to stubble or trashy soils as well as pre-worked stubble. To allow Rival 10 G penetration to the soil surface, very heavy trash soils should be pre-worked prior to application. If green growth is heavy, destroy this growth before applying Rival 10 G with either a suitable chemical or cultivation.
4. An over-application caused by overlapping, improper applicator calibration or non-uniform application may result in reduced crop stand, delayed development or reduced yields.

Incorporation:

Refer to Incorporation of Soil-Applied Herbicide section on page 12 for general incorporation procedures.

May-June - Apply Rival 10 G to the soil surface and for best results incorporate immediately in the same direction as application, in the same operation if possible. Do not delay incorporation more than 24 hours after application. Incorporate with a field cultivator or disc implement set to work 5-8 cm (2-3 in.) deep. A deep tillage cultivator may be needed for the first incorporation if trash conditions warrant its use. A second incorporation at the same depth and at right angles to the first must not be done sooner than 5 days after the first incorporation. This second incorporation may be delayed until new weed regrowth requires a cultivator or discing. After the 2 incorporations, additional tillage operations may be required to control resistant weed growth.

September-October - Apply Rival 10 G after harvest until freeze-up and for best results incorporate immediately in the same direction as application. Do not delay incorporation more than 24 hours of application. Incorporate with a deep tillage cultivator, field cultivator or disc implement set to work 5-8 cm (2-3 in.) deep. A second fall incorporation at the same depth and at right angles to the first must not be done sooner than 5 days after the first incorporation. Alternatively to conserve trash cover throughout the winter, this second incorporation may be done in the spring, at the time of seedbed preparation. Subsequent workings must be no deeper than 8 cm (3 in.). DO NOT incorporate when the soil is in poor working condition (wet, lumpy or cloddy). DO NOT incorporate with rodweeders, harrows, or hoe drills. DO NOT apply Rival 10 G in the fall for wild millet control in wheat where soil organic matter is less than 2% or greater than 8%.

Spring Tillage for Seedbed Preparation:

Seedbed preparation should be done using a field cultivator or disc implement set to cut 5 cm (2 in.) deep when the soil is warm enough to promote good germination. Ensure weed seedlings are destroyed and not transplanted during the spring operations. Seeding implements must be set to place the wheat seed at a 3-6 cm (1.2-2.4 in.) depth.

If a discer or air seeder is used for seeding, separate spring tillage may not be necessary. After seeding, the seedbed should be firmly packed or harrowed to promote good germination.

To avoid wheat injury, use quality seed and seeding practices which promote good growing conditions. Avoid deep seeding, loose seedbeds, and seeding into cold soils.

Sencor 75 DF, 75 DF Solupak, Sencor 500 (metribuzin) Chemagro

Activity: Sencor 75 DF 75% dry flowable
Sencor 500 500 g active ingredient/litre

Registered Uses:

Crops*	Recommended Rates of Product Sencor 75 DF/75 DF Solupak	 Sencor 500
Barley	275-375 g/ha (110-150 g/ac)	425-550 mL/ha (170-220 mL/ac)
Johnston, Leduc and Klondike	275 g/ha (110 g/ac)	425 mL/ha (170 mL/ac)
Wheat (spring, durum)	275 g/ha (110 g/ac)	425 mL/ha (170 mL/ac)
Lentils	275 g/ha (110 g/ac)	425 mL/ha (170 mL/ac)
Field Peas	275-375 g/ha (110-150 g/ac)	425-550 mL/ha (170-220 mL/ac)
Triazine tolerant canola	275 g/ha (110 g/ac)	425 mL/ha (170 mL/ac)
Fababeans	Sencor + Treflan (tank-mix only)	(See tank-mix section below)

At 275-375 g/ha one 3 kg container treats 10.9-8.0 ha (27.0-19.8 ac).
At 425-550 mL/ha one 5 litre container treats 11.8-9.1 ha (29.0-22.5 ac).

Weeds controlled: Hemp-nettle, chickweed, corn spurry, lamb's-quarters, stinkweed, volunteer canola, wild mustard, tartary buckwheat, ball mustard, smartweed, lady's-thumb. Wild buckwheat is not controlled. Use the higher rate for best residual control of chickweed and hemp-nettle or when weed infestation is heavy.

Application:

Apply in 100 L of water/ha (40 L/ac). Sprayer should be equipped with tips no finer than 6502, 8002 or LF2, nozzle screens no finer than 50 mesh and 50 mesh or larger line strainers. A pump of sufficient capacity to provide adequate volume through the by-pass and/or jet agitation system is essential.

Special Instructions for Solupak:

The Sencor 75DF Solupak is water soluble and will dissolve completely in water. After opening outer bag, drop the required number of unopened inner packets into the spray tank as directed. Do not excessively handle water soluble packets or expose to moisture since this may cause breakage. Do not allow packets to become wet prior to mixing spray solution. Do not handle with wet hands. Reseal outer bag to protect remaining packets. CAUTION: Do not use packets in liquid fertilizer.

Timing:

1. Apply when the cereal crop is in the 2-5 leaf stage. Crop must be seeded at least 5 cm (2 in.) deep.
2. Apply to lentils or peas prior to 15 cm (6 in.) vine length in 170 L of water/ha (68 L/ac) to reduce the risk of crop injury. For maximum lentil crop tolerance it is recommended to apply Sencor at the 2-5 node stage. Do not use on lentils or peas seeded less than 5 cm (2 in.) deep or in soils with less than 4% organic matter. Allow 3 days after cool, wet weather before application to lentils or peas.

Special Instructions for Lentil:

For optimum weed control apply Sencor in a split application. The first application should be made at the cotyledon to 2-leaf stage of the weeds in the rate range of 85-110 mL/ac Sencor 500 or 55-75 g/ac Sencor 75 DF or 75 DF Solupak. The second application should be made when a second flush of weeds have emerged or if weeds which were more advanced at the time of the first application have started to show regrowth. The split applications are normally 7-10 days apart.

3. Apply to triazine tolerant canola in a minimum 170 L of water/ha (68 L/ac) after weeds have emerged and are less than 5 cm (2 in.) in height or diameter. Allow 3 days after cool, wet weather before application. Note: THIS TREATMENT IS FOR USE ONLY ON TRIAZINE TOLERANT CANOLA (Variety OAC Triton pedigreed seed only). NON-TRIAZINE TOLERANT CANOLA WILL BE KILLED BY SENCOR.

Mode of Action:

Sencor is a systemic herbicide and kills susceptible plants by inhibiting photosynthesis. Control may not be noticeable for 7-10 days after treatment.

Precautions:

*1. Although Sencor is registered for application as a fall treatment to winter wheat the Provincial Weed Committee does not recommend these treatments because of inconsistent results and the lack of supporting data.

2. Sencor may be applied when the crop is wet with dew but weed control may be reduced if there is rainfall within 6 hours after application.
3. Initial temporary (7-10 days) lightening in crop color and occasionally a slight reduction in crop height may occur especially if frost or abnormally high temperatures occur within 1-2 days of application. If frost occurs prior to application, allow 4-5 days for crop to recover before applying Sencor.
4. DO NOT use on crops underseeded to forages.
5. DO NOT graze or feed treated crops to livestock within 30 days of application. Do not harvest for grain within 60 days of application.
6. DO NOT harvest triazine tolerant canola for seed within 75 days of application.
7. Continuous agitation is required during spraying. Do not let spray mixture stand without agitation or settling may occur.
8. Allow a 4-5 day interval between application of Sencor and wild oat herbicides.

Sprayer Clean-up:

Drain any remaining spray solution of SENCOR from the spray tank and discard in non-crop areas away from water supplies. Rinse the spray tank and refill with water adding a heavy-duty detergent at the rate of 250 mL/100 L of water. Recycle this mixture through the equipment for 5 minutes and spray out. Repeat this procedure twice. Fill the spray tank with clean water, recycle for 5 minutes, and spray out. Clean pump and nozzle screens thoroughly. Wash away any spray mixture from the outside of the spray tank, nozzles or spray rig.

Mixing:

1. SENCOR or SENCOR DF at the recommended rates on **barley** and **wheat** with:
   (a) 2,4-D amine or MCPA amine at 0.84-1.1 L/ha (0.34-0.45 L/ac) when the crop is in the 3-5 leaf stage or
   (b) BANVEL HERBICIDE at 230 mL/ha (90 mL/ac) when the crop is in the 2-3 leaf stage. DO NOT apply to Klondike, Johnston or Leduc barley or;
   (c) TARGET at 1.0-1.5 L/ha (0.40-0.60 L/ac) when the crop is in the 2-3 leaf stage (Sencor 500 only).

   Application of these tank mixes at later crop stages may result in reduced crop tolerance especially if the crop is under stress. DO NOT apply these mixtures to Klondike, Johnston, or Leduc barley.
2. Mix SENCOR 500 or SENCOR 75 DF with TREFLAN EC for broadleaf and grassy weed control in **fababeans**. Do not apply to soils containing less than 4% organic matter. Apply fall or spring (before planting) in 100 L of water/ha (40 L/ac) and incorporate immediately following the recommendation for Treflan incorporation.
   (a) For spring application mix SENCOR 500 at 550-850 mL/ha (220-340 mL/ac) or SENCOR 75 DF at 375-550 g/ha (150-220 g/ac) with TREFLAN at 1.5-2.0 L/ha (0.6-0.8 L/ac).
   (b) For fall application mix SENCOR 500 at 850 mL/ha (340 mL/ac) or SENCOR 75 DF at 550 g/ha (220 g/ac) with TREFLAN at 2.0-2.6 L/ha (0.8-1.1 L/ac).
3. Mix SENCOR 500 or SENCOR 75 DF with TREFLAN EC for grassy and broadleaf weed control, including stinkweed and wild mustard, in **triazine tolerant canola** (Fall or spring application) and **peas** (fall application only). Apply fall or spring (before planting) in 100 L of water/ha (40 L/ac) and incorporate immediately following the recommendations for Treflan incorporation.
   (a) For spring application mix SENCOR 500 at 425-550 mL/ha (170-220 mL/ac) or SENCOR DF at 275-375 g/ha (110-150 g/ac) with TREFLAN at 1.5 L/ha (0.6 L/ac) on light soils with less than 6% organic matter. On medium or heavy soils with 6-15% organic matter apply SENCOR 500 at 550-850 mL/ha (220-340 mL/ac) or SENCOR 75 DF at 375-550 g/ha (150-220 g/ac) with TREFLAN at 2.0 L/ha (0.8 L/ac).
   (b) For fall application mix SENCOR 500 at 550-700 mL/ha (220-280 mL/ac) or SENCOR 75 DF at 375-475 g/ha (150-190 g/ac) with TREFLAN at 2.0 L/ha (0.8 L/ac) on light soils with less than 6% organic matter. On medium or heavy soils with 6-15% organic matter apply SENCOR 500 at 700-850 mL/ha (220-340 mL/ac) or SENCOR 75 DF at 475-550 g/ha (190-220 g/ac) with TREFLAN at 2.6 L/ha (1.1 L/ac). Do not apply to peas in soils with less than 4% organic matter.

   Note: SENCOR rate varies with soil organic matter; the higher the organic matter the higher the rate of Sencor required. Refer to table below.

   Always add Sencor to the spray tank first. Continuous agitation is required throughout the mixing and spraying operations. FOLLOW ALL LAND PREPARATION, MIXING, SPRAYING, INCORPORATION DIRECTIONS AND PRECAUTIONS AS OUTLINED ON THE SENCOR AND TREFLAN LABELS. NON-TRIAZINE TOLERANT CANOLA WILL BE KILLED BY THIS TANK-MIX.
4. When applying SENCOR 500 or SENCOR 75 DF post-emergence to triazine tolerant canola DO NOT tank-mix with any other pesticides, fertilizers or spray adjuvants.

% Organic Matter	Spring		Fall	
	Sencor 500	**Sencor 75DF**	**Sencor 500**	**Sencor 75DF**
2-3	425 mL/ha	275 g/ha	550 mL/ha	375 g/ha
3-6	550 mL/ha	375-400 g/ha	700 mL/ha	475 g/ha
6-10	550-850 mL/ha	400-550 g/ha	700-850 mL/ha	475-550 g/ha
10-15	850 mL/ha	550 g/ha	850 mL/ha	550 g/ha

On soils with 10% organic matter and higher, broadleaf control may not be adequate.

Stampede 360 (propanil) — Use Only as a Tank-Mix With 2,4-D, MCPA or Glean

Rohm & Haas

Activity: 360 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rate of Product**
Wheat (spring, durum), barley, oats, flax, canary seed	2.75 L/ha (1.10 L/ac)

At 2.75 L/ha one 22.7 litre container treats 8.2 ha (20.4 ac).

Weeds controlled: Green foxtail (wild millet), yellow foxtail, wild buckwheat, tartary buckwheat, redroot pigweed, lamb's-quarters, stinkweed (rosette stage), shepherd's-purse, bluebur, smartweed, lady's-thumb.

Application:

Apply in 100 L of water/ha (40 L/ac) using flat fan nozzles (e.g. LF2-80 degrees, 8002, 6502, LF2-65 degrees, etc.) and 275 kPa (40 psi). Use 50 mesh screens in nozzles and pump. Maintain a three-day interval between application of Stampede 360 tank mixes and other herbicides. Application may be made with floater-type equipment, with best results at 150 L water/hectare (60 L/ac) and 275 kPa (40 psi) and at speeds not in excess of 16 km/h (10 mph). Application by aircraft or other low volume equipment is not recommended.

Timing:

1. Apply when the majority of green foxtail is in the 3-leaf stage and less than 2.5 cm (1 in.) in height. Broadleaved weeds should be in the 2-4 leaf stage. Under dry conditions (more than 5 cm (2 in.) of dry soil at the surface), apply when green foxtail is in the 2- 3 leaf stage, since control of green foxtail in the 4-leaf stage and beyond will not be satisfactory under dry soil conditions.
2. Apply when cereal crops are in the proper stage for the tank-mix being used. Apply to flax at least 5 cm (2 in.) but not more than 12.5 cm (5 in.) in height. Do not spray flax when the temperature exceeds 30 C. Under stress conditions, suppression of flax growth immediately after treatment and some delay in maturity can be expected.

Mode of Action:

Stampede is a contact herbicide, therefore, thorough coverage of the weeds and proper timing are important. Note: Stampede may cause temporary crop yellowing or leaf-tip burn 2-5 days after application.

Insecticides:

Injury of crop plants may result from a tank-mix or sequential application of Stampede 360 and certain insecticides. If an insecticide is required in the same year that Stampede 360 has been or will be applied, use the recommended insecticides as follows:

> The insecticide Decis (deltamethrin) may be applied at any time before or after an application of Stampede 360, or as a tank-mix with Stampede 360. Consult the Decis label for application rate and other instructions. Furadan (carbofuran) may be applied on wheat five days after an application of Stampede 360 or on barley ten days after an application of Stampede 360. Cygon (dimethoate) or malathion may be applied 14 days after an application of Stampede 360. **No other insecticides can be used during the same year that Stampede 360 is applied.** Crops grown from seed protected with dual purpose seed dressings may be treated with Stampede.

Precautions:

1. DO NOT apply to crops under severe drought stress.
2. DO NOT use water that is colder than 10 C.
3. Spray out Stampede 360 within 6 hours of mixing to prevent crystalization on screens. Empty and wash out spray tank after each day's spraying.
4. Stampede 360 may be stored at freezing temperatures but must be returned to its original state by warming to room temperature (20-22 C) and agitating thoroughly on several successive days before use.
5. DO NOT spray if rainfall is expected within 1 hour.
6. There are no grazing restrictions.
7. DO NOT apply to crops grown in fields in which triazine herbicides such as atrazine, Blagal, Bladex, Lexone or Sencor have been applied until the triazine residues have completely disappeared.

Mixing:

1. Mix STAMPEDE 360 with:
   - (a) MCPA ESTER at 0.55 L/ha (0.22 L/ac) to control a wider spectrum of broadleaf weeds in **wheat**, **barley** and **oats** when in the 2-5 leaf stage, **flax** when it is 5-12.5 cm (2.5 in) high and **canary seed** in the 2-4 leaf stage.
   - (b) 2,4-D AMINE at 1.2 L/ha (0.49 L/ac) or 2,4-D LV ESTER 600 g active ingredient/litre at 0.66-1.0 L/ha (0.28-0.40 L/ac) to control a wider range of broadleaf weeds, including Russian thistle. Apply to **wheat** only when it is in the 4 to 5 leaf stage. Use the low rate of 2,4-D ester for durum wheat.
2. Mix STAMPEDE 360 with GLEAN at 15 g/ha to control green foxtail and broadleaf weeds in **wheat** and **barley** (**Argyle**, **Bedford**, and **Klages** only). Apply when the crop is in the 2-5 leaf stage and the majority of foxtail is in the 3-leaf or smaller stage. Ensure Glean is in suspension before adding Stampede 360, followed by the required amount of surfactant. Continuous agitation is required.
3. Always add 2,4-D, MCPA or Glean to the spray tank prior to adding Stampede 360.
4. DO NOT tank-mix Stampede 360 with any other pesticides (except as recommended), fertilizers or additives. A 3-day interval should be allowed before or after application of Stampede 360 tank mixes and any other herbicide.

Stampede CM (propanil and MCPA ester 7:2) — Rohm & Haas

Activity: 460 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate of Product
Barley, oats, flax, wheat (spring, durum), canary seed	2.75 L/ha (1.10 L/ac)

At 2.75 L/ha one 22.7 litre container treats 8.2 ha (20.4 ac).

Weeds controlled: Green foxtail (wild millet), yellow foxtail, lady's-thumb, smartweed, lamb's-quarters, redroot pigweed, wild buckwheat, tartary buckwheat, bluebur, wild mustard, stinkweed, shepherd's-purse, volunteer canola, kochia, flixweed.

Application:

Apply in 100 L of water/ha (40 L/ac) using flat fan nozzles (e.g. LF2-80 degrees, 8002, 6502, LF2-65 degrees, etc.) and 275 kPa (40 psi). Use 50 mesh screens in nozzles and pump. Maintain a 3-day interval between application of Stampede CM and other herbicides. Application may be made with floater-type equipment, with best results at 150 L water/ha (60 L/ac) and 275 kPa (40 psi) and at speeds not in excess of 16 km/h (10 mph). Application by aircraft or other low volume equipment is not recommended.

Timing:

Apply when the majority of green foxtail are in the 3-leaf stage and less than 2.5 cm (1 in.) in height. Broadleaved weeds should be in the 2-4 leaf stage. Under dry conditions (more than 5 cm (2 in.) of dry soil at the surface), apply when green foxtail is in the 2- 3 leaf stage, since control of green foxtail at the 4-leaf stage and beyond will not be satisfactory under dry soil conditions.

Apply when the cereal is in the 2-5 leaf stage and when the canary seed is in the 2-4 leaf stage. Apply to flax when it is at least 5 cm (2 in.) tall, but not more than 12.5 cm (5 in.) tall. Do not spray flax when the temperature exceeds 30 C. Under stress conditions, suppression of flax growth immediately after treatment and some delay in maturity can be expected.

Mode of Action:

Stampede CM is a contact herbicide, therefore thorough coverage of the weeds and proper timing are essential. Stampede CM may cause temporary crop yellowing or leaf-tip burn 2-5 days after application. Under normal growing conditions these effects are temporary and new growth is normal.

Insecticides:

Injury of crop plants may result from a tank-mix or sequential application of Stampede CM and certain insecticides. If an insecticide is required in the same year that Stampede CM has been or will be applied, use the recommended insecticides as follows:

> Furadan (carbofuran) may be applied on wheat five days after an application of Stampede CM or on barley ten days after an application of Stampede CM. Cygon (dimethoate) or malathion may be applied 14 days after an application of Stampede CM. **No other insecticides can be used during the same year that Stampede CM is applied.** Crops grown from seed protected with dual purpose seed dressings may be treated with Stampede.

Precautions:

1. DO NOT apply to crops under drought stress.
2. DO NOT use water that is colder then 10 C.
3. Spray out Stampede CM within 6 hours of mixing to prevent crystallization on screens. Empty and wash out spray tank after each day's spraying.
4. Stampede CM may be stored at freezing temperatures but must be returned to its original state by warming to room temperature (20-22 C) and agitating thoroughly on several successive days before use.
5. DO NOT apply if rain is expected within 1 hour.
6. DO NOT apply to crops grown in fields in which triazine herbicides such as atrazine, Blagal, Bladex, Lexone or Sencor have been applied until the triazine residues have completely disappeared.

Mixing:

DO NOT tank-mix STAMPEDE CM with other herbicides, insecticides, fertilizers or spray adjuvants (wetting agents). A three day interval should be allowed before or after application of Stampede CM and any other herbicide.

TCA; NaTA/ Bar-Fox DS (TCA) — Hoechst/Ciba-Geigy

Activity: TCA/NaTA 850 g active ingredient/kg
Bar-Fox 830 g active ingredient/kg

Registered Uses:

Crops	**Recommended Rates of Product TCA/NaTA/Bar-Fox**
Barley	1.3 kg/ha (0.53 kg/ac)
Oats	1.3-2.7 kg/ha (0.53-1.10 kg/ac)
Canola	2.7-4.5 kg/ha (1.10-1.8 kg/ac)
Flax	4.0-5.4 kg/ha (1.6-2.2 kg/ac)
Peas (field)	4.5-5.4 kg/ha (1.8-2.2 kg/ac)

Weeds controlled: Green and yellow foxtail (wild millet).

Application and Timing:

1. Use the lower rate on light, sandy soils.
2. Barley and Oats - apply in 90-100 L of water/ha (35-40 L/ac) when the weeds have 1-3 leaves and the crop has 2-4 leaves.
3. Canola and Flax - apply in 100-165 L of water/ha (40-65 L/ac) before the weeds have 4 true leaves. Canola should be in the 2-4 leaf stage. Flax should be 10-15 cm (4-6 in.) tall.
4. Peas - apply in 100-165 L of water/ha when weeds are in the 1-3 leaf stage and pea vines are 10-15 cm (4-6 in.) long.

Mode of Action:

1. TCA acts mainly through the soil so activity will be greatest on sandy soil and under good moisture conditions.
2. TCA inhibits growth of the weeds. Rates recommended for cereals will severely stunt green foxtail but do not usually give complete kill.
3. Delay in barley and oat maturity may occur.

Precautions:

1. Oats and barley should be seeded 5 cm (2 in.) deep or deeper to reduce chances of crop injury.
2. Flush the sprayer thoroughly after each use.
3. Adequate agitation and gradual addition of material to spray tank is needed during mixing to completely dissolve TCA. Pre-dissolve TCA in a small amount of warm water to ensure quick and complete mixing.
4. DO NOT graze treated areas for at least 24 hours after treatment.
5. Use 50 mesh screens and filters. Stainless steel or hardened stainless steel nozzle tips are recommended. Pumps should be of sufficient capacity for adequate agitation through the by-pass or jet agitator which should terminate in the bottom of the tank.
6. A light rain after application is beneficial.
7. Not all brands of TCA are registered for the same uses. Refer to product labels for complete details.

Mixing:

1. Mix TCA, NaTA or Bar-Fox at the recommended rate with 2,4-D AMINE up to 1.1 L/ha (0.45 L/ac) to control broadleaf weeds and green foxtail in **barley**. Apply at the 4-leaf stage of the crop when the weeds are in the 1-3 leaf stage. Use 100 L of water/ha (40 L/ac). Completely dissolve TCA in water before adding 2,4-D. Flush sprayer tank thoroughly with water after applying TCA.
2. Mix TCA, NaTA or Bar-Fox at recommended rates with:
   (a) MCPA AMINE up to 1.1 L/ha (0.45 L/ac) or
   (b) MCPA SODIUM SALT up to 1.9 L/ha (0.77 L/ac) to control green foxtail and broadleaf weeds in **barley**, **oats** and **flax**. Apply when the cereal is in the 2-4 leaf stage, flax is 5-10 cm (2-4 in.) tall and the weeds are in the 1-3 leaf stage. Use the lower rate of TCA on sandy soils. Apply in 100 L of water/ha (40 L/ac). Completely dissolve TCA in water before adding MCPA. Flush sprayer tank thoroughly with water after applying TCA.
3. Mix TCA, NaTA or Bar-Fox at the recommended rate in **peas** with:
   (a) MCPA AMINE up to 0.56 L/ha (0.23 L/ac) or
   (b) MCPA SODIUM SALT up to 0.93 L/ha (0.37 L/ac) when peas are 10-20 cm (4-8 in.) tall. Completely dissolve TCA in water before adding to broadleaf herbicide.

Target (dicamba + mecoprop + MCPA, 1:1:4.4) Ciba-Geigy

Activity: 400 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates of Product**
Wheat (spring, durum, winter), barley, oats, canary seed	1.0-1.5 L/ha (0.40-0.6 L/ac)

At 1.0-1.5 L/ha one 10 litre container treats 10.0-6.7 ha (24.7-16.5 ac).

Weeds controlled: Hemp-nettle*, wild buckwheat, annual smartweed species, Russian thistle, (seedling to 5 cm (2 in.) tall), sow-thistle (annual), corn spurry, knotweed, volunteer buckwheat, ragweed, stinkweed, mustards (except dog mustard), pigweeds (prostrate, redroot), lamb's-quarters, cow cockle, tartary buckwheat, volunteer sunflowers, flixweed, shepherd's-purse, volunteer canola, cleavers (1.5 L/ha at 1-2 whorl stage), kochia, night-flowering catchfly, top growth control of Canada thistle, field bindweed and perennial sow-thistle.

*Suppression only, apply before the second pair of leaves.

Application:

1. Use at least 100 L of water/ha (40 L/ac) to reduce the risk of crop injury.
2. Use the 1.5 L/ha (0.6 L/ac) rate of application when weeds are beyond the 3-leaf stage, when weed densities are high, under adverse weather conditions and for the control of cleavers and overwintered winter annuals or for topgrowth control of perennial weeds.

Timing:

1. Although registered for application to the 2-5 leaf stage of wheat, oats, canary seed and the 2-4 stage of barley, in Saskatchewan it is recommended to spray at the 2-4 leaf stage of wheat, oats and canary seed, and the 3-leaf stage of barley. Treatment at the 3-leaf stage of the crop will usually combine maximum crop tolerance and weed susceptibility. Apply to winter wheat in spring before crop is 30 cm (12 in.) high.
2. Application at higher rates or after the 4-leaf stage or at low water volumes will usually result in stem bending and delayed maturity. Under conditions conducive to prolific tillering, the yield may also be reduced. Very severe yield losses due to sterility will result from treatment during the flag leaf to the early heading stage.

Mode of Action:

Target is a translocated herbicide which affects the root of the plant. It is slower acting than most other broadleaf herbicides and death of the plants may take 2-3 weeks.

Precautions:

1. DO NOT use on cereals underseeded to legumes.
2. DO NOT freeze.
3. DO NOT apply if rainfall is expected within 3 hours.
4. DO NOT graze or harvest for livestock feed within 7 days of application.

Mixing:

1. Mix TARGET at recommended rates with SENCOR 500 at 275-425 mL/ha (110-170 mL/ac) for control of chickweed and other broadleaf weeds in **wheat** and **barley**. Application of this tank-mix at late crop stages may result in reduced crop tolerance especially if the crop is under stress. Do not use this tank-mix on oats. Do not apply to KLONDIKE, JOHNSTON or LEDUC barley.
2. Mix TARGET at recommended rates with AFOLAN F at 470 mL/ha (190 mL/ac) or LOROX L at 425 mL/ha (170 mL/ac) for control of chickweed and other broadleaf weeds in **wheat**, **oats** and **barley**.
3. Mix TARGET at recommended rates with TCA at 1.25 kg/ha (0.5 kg/ac) to control broadleaf weeds and green foxtail (wild millet) in **barley**. Apply when the green foxtail is in the 1-3 leaf stage. Ensure TCA is in suspension before adding Target.

Tordon 202-C (picloram + 2,4-D, 1:16) **DowElanco**

Activity: 212 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates of Product**
Barley, Wheat (spring, durum)	2.0 L/ha (0.8 L/ac)

At 2.0 L/ha one 2x8 litre container treats 8 ha (20 ac).

Weeds controlled: - Russian thistle, redroot pigweed, lamb's-quarters, cocklebur, wild mustard, wild buckwheat, spring stinkweed seedlings, green smartweed, tartary buckwheat, dandelion seedlings, Canada thistle top growth, perennial sow-thistle top growth.

Application:

Apply in a minimum of 100 L of water/ha (40 L/ac). Spray at 200-275 kPa (30-40 psi). Use ground spray equipment only.

Timing:

Apply when the crop is in the 3-5 leaf stage.

Mode of Action:

Picloram is a growth regulator type herbicide and is absorbed by both roots and leaves and is translocated to all parts of the plant. It can remain active in the soil throughout the growing season and will control some late germinating weeds. The weeds will not die immediately after treatment. The rate of growth will slow and gradually cease and therefore will not compete with the crop growth or interfere with harvest. Wheat straw may be shortened slightly.

Precautions:

1. Rapeseed, mustard, canary seed, flax, rye, wheat, barley, oats, triticale, corn, sorghum or any grass seed can be grown on land treated with Tordon 202C in previous years. However, severe damage can result if barley or wheat crops underseeded to legumes are treated. Fields previously treated with Tordon 202C herbicide should not be planted to alfalfa and sunflowers until at least the third growing season after the year of treatment; beans, lentils, peas and potatoes until at least the fifth growing season after the year of treatment. It is recommended that a field bioassay using the susceptible crop(s) be undertaken the year prior to commercial production by seeding test strips of the susceptible crop(s) into the treated area and carefully observing growth and seed set. Pulse crop producers should carefully consider the long term effects on crop rotations before choosing this product.
2. Tordon is a very active herbicide on certain plants. Do not allow spray drift to contact sensitive crops or other desirable vegetation. Do not contaminate non-target land areas, cropland, water, irrigation or drainage ditches.
3. Grazing and manure: DO NOT use straw from treated crops for composting or mulching on susceptible broadleaf crops. If the straw is used for bedding or animal feed, return the manure to fields to be planted to grain crops, flax or canola. DO NOT permit meat animals being finished for slaughter nor dairy animals to forage or graze treated fields within 2 weeks of treatment.
4. DO NOT apply if rainfall is expected within 6 hours.
5. DO NOT freeze.

Sprayer Clean-Up Procedures:

1. Drain and flush the spray system with clean water in an area well away from sensitive crops or trees.
2. Fill the system with a 1:100 mixture of household ammonia and water; circulate the mixture through the system for five minutes, then let stand for 24 hours.
3. Drain the system and flush with clean water before use with other pesticides.

Mixing:

DO NOT tank-mix TORDON 202-C with any other herbicides or spray additives.

Treflan EC, QR5 (trifluralin) — Dow Elanco

Activity: Treflan 545 g active ingredient/litre
Treflan QR5 5% granules

Registered Uses:

Crops	**Recommended Rates of Product**		
	Fall Granular	**Fall Liquid**	**Spring Liquid**
Canola, triazine tolerant canola, sunflowers peas, mustard, fababeans, seedling alfalfa, dry beans (kidney, white)	22-28 kg/ha (8.9-11.3 kg/ac)	2.0-2.6 L/ha (0.8-1.1 L/ac)	1.5-2.0 L/ha (0.6-0.8 L/ac)
Flax, lentils	22-28 kg/ha (8.9-11.3 kg/ac)	2.0-2.6 L/ha (0.8-1.1 L/ac)	Not Recommended
Wheat (spring, durum)	11 kg/ha (4.4 kg/ac)	Not Recommended	1.1-1.5 L/ha (0.45-0.6 L/ac)
Barley	17-28 kg/ha (6.9-11.3 kg/ac)	Not Recommended	1.1-1.5 L/ha (0.45-0.6 L/ac)
Safflower	Not Recommended	2.0-2.6 L/ha (0.8-1.1 L/ac)	1.5-2.0 L/ha (0.6-0.8 L/ac)
Sainfoin, sweet clover	Not Recommended	Not Recommended	1.5-2.0 L/ha (0.6-0.8 L/ac)

Summer Application: flax, triazine tolerant canola, safflower (EC only) and canola only - 3.0 L/ha (1.2 L/ac), 34 kg/ha (13.8 kg/ac). Not recommended on sand, sandy loam soils.

At 22-28 kg/ha one 25 kg bag treats 1.14-0.89 ha (2.8-2.2 ac).
At 1.5-2.0 L/ha one 8.3 litre container treats 5.5-4.2 ha (13.7-10.3 ac).

Weeds controlled: Wild oats, green and yellow foxtail (wild millet), barnyard grass, wild buckwheat, cow cockle, redroot pigweed, lamb's-quarters, chickweed, purslane, knotweed, Persian darnel.

Rates recommended for barley and wheat will control green and yellow foxtail (wild millet) only.
Use 17-22 kg/ha (6.9-8.9 kg/ac) in the brown soil zones with 2-4% organic matter. Use 22- 28 kg/ha (8.9-11.3 kg/ac) in the black soil zones with 4-6% organic matter.

Application and Timing:

1. Use the lower rate on light sandy soils or soils with less than 6% organic matter. Use the higher rate on heavier soils (loams and clays) and all soils with 6-15% organic matter.
2. Do not apply to peat or muck soils, wet soils, soils in poor working condition or soils which contain more than 15% organic matter, or soils that are subjected to prolonged periods of flooding.
3. Fields should be cultivated to destroy existing growth before applying Treflan liquid. When applying to stubble fields, chop and thoroughly mix crop residues into the soil to a depth of 10 cm (4 in.). Disc type implements provide best results.
4. Apply Treflan EC in 100 L of water/ha (40 L/ac).
5. The granular formulation is best suited for use under trashy conditions and is recommended for **Summer and Fall application only**. If soil is hard or if trash cover is very heavy, precultivation is necessary to ensure adequate mixing of the granules in the soil. For best results the second incorporation should be done before spring. Incorporate as outlined below for summer and fall applications.

Spring - apply and for best results incorporate once immediately, in the same operation if possible. Do not delay incorporation more than 24 hours after application. The second incorporation may be done at the time of seedbed preparation provided it is done at the recommended depth.

Fall - apply between September 1 and freeze-up. For best results incorporate immediately, in the same operation if possible. Do not delay incorporation more than 24 hours after application. It is preferred to do both incorporations in the fall, followed by shallow tillage in the spring prior to planting. However one incorporation may be done in the fall and the second in the spring to a depth of 8-10 cm (3-4 in.).

Summer - apply between June 1 and September 1 and for best results incorporate immediately, in the same operation is possible. Do not delay incorporation more than 24 hours after application. Second and subsequent incorporations may be done any time prior to soil freeze-up.

Incorporation:

For Oilseed and Pulse Crops

For best results incorporate immediately. The first incorporation is best done in combination with the application operation and should not be delayed more than 24 hours after application. Two operations at right angles are required. When applied in the summer or fall, the second incorporation can be delayed until spring although two fall incorporations are preferred. When both incorporations are done in the fall, a shallow cultivation is required in the spring prior to planting.

Use a tandem disc, discer or vibrashank cultivator set to 8-10 cm (3-4 in.) deep. Operate disc implements at 7-10 km/h (4.3-6.2 mph) and cultivators at 8-10 km/h (5-6.2 mph). Rod-weeders, harrows or hoe-drills, deep tillage cultivators or chisel plows will not properly incorporate Treflan.

Special Instructions for Flax and Lentils:

a. Both incorporations should be completed before freeze-up in the fall prior to seeding flax or lentils the next spring.
b. Work the seedbed to a shallow depth and pack just prior to seeding to ensure a firm seedbed and accurate planting depth. Use a double disc press or hoe press drill. Seed into a moist seedbed no more than 4 cm deep (1.6 in.). Do not seed into cold soil. Seeding should generally be delayed until at least May 15. Conditions which result in slow germination and emergence will greatly increase the risk of a poor flax or lentil stand.

Special Instructions for Treflan QR5 Applied in Fall for Barley:

a. Use the recommended rates as it pertains to soil type for barley.
b. Do not apply Treflan QR5 for barley on land treated with Treflan, Rival, Heritage, Advance, Free Flow or Triflurex since June 1 of the previous year.
c. Do not apply on grey-wooded soils or other soils containing less than 2% organic matter, or on black/deep black soils containing more than 6% organic matter. Application to severely eroded knolls can result in reduced crop stand.
d. General directions for "Land Preparation", "Application" and "Incorporation" are the same as for use on oilseed crops.
e. Both incorporations of Treflan QR5 should be done in the season of application (fall).
f. Seeding should be with a press drill or hoe drill. Seed into a moist, warm seedbed with the drill set to seed shallow (no deeper than 5 cm (2 in.)).
g. Use of discers and air seeders can result in uneven and variable seeding depth. If they are used for seeding barley, the field should be packed after the seeding to give a firm seedbed.
h. **Do not seed early when soil conditions are cold**.
i. Conditions which result in slow germination and emergence will greatly increase the risk of a poor barley stand.

Special Instructions for Spring Applied Treflan EC For Cereals - Spring application of Treflan EC in wheat and barley for control green foxtail (wild millet) only.

1. Seed crop 5-7.5 cm deep (2-3 in.).
2. Apply Treflan as soon as possible after seeding (before crop emergence). The soil surface should be free of trash.
3. Shallow incorporate with two passes of diamond or tine harrows in different directions at speeds of 8 km/h (5 mph). Application and first incorporation should be done in the same operation if possible. The second incorporation must be completed within 24 hours of application.

Special Instructions for Fall Applied Treflan QR5 for Control of Green Foxtail in Wheat

a. 11 kg/ha (4.4 kg/ac) is the maximum rate for wheat. Higher rates will result in crop injury.
b. Do not apply Treflan QR5 for wheat on land treated with Treflan, Rival, Heritage, Advance, Free Flow or Triflurex in the current or previous crop years.
c. Apply to summerfallow, or standing or preworked stubble between September 1 and freeze-up with a properly calibrated granular herbicide applicator to soils between 2-8% organic matter.
d. Apply Treflan QR5 uniformly to the soil surface and for best results incorporate immediately in the same operation if possible. Do not delay incorporation more than 24 hours after application.

e. Incorporate in two different directions at the same depth using a field cultivator, deep tillage cultivator or disc implement operated at 8-10 km/hr (5-6.2 mph) set to 5-8 cm (2-3 in.) deep. Incorporation with implements set to cut less than 5 cm (2 in.) deep or more than 8 cm (3 in.) deep may result in erratic weed control or crop damage.

f. Both incorporations may be completed in the fall. If so, it is recommended that the second working be delayed at least 3 days following the first.

g. Do not incorporate with a field cultivator when the soil is crusted, lumpy, or too wet for good mixing action. Rod weeders, harrows, or hoe drills, will not properly incorporate Treflan QR5.

h. When only one incorporation is completed in the fall to conserve trash cover, the spring tillage should be done at an angle or cross direction to the fall incorporation with the implement operated at a 5-8 cm (2-3 in.) depth. When both incorporations are completed in the fall, shallow spring tillage (no deeper than fall incorporation) should be completed with a cultivator or disc implement.

i. Seed into a firm, moist weed-free seedbed using a double disc press drill or hoe drill set to seed 3-6 cm (1.2-2.4 in.) deep.

j. If a discer or air seeder is used for seeding, separate spring tillage may not be necessary. However, care must be exercised, such that the discer or air seeder is set to uniformly place the seed 3-6 cm (1.2-2.4 in.) deep and the seedbed should be firmly packed or harrowed after seeding to promote good germination.

k. To reduce the risk of wheat injury, use quality seed and agronomic practices which will promote good growing conditions - **avoid deep seeding, loose seedbeds, and seeding into cold soils**.

l. Application to severely eroded knolls is not recommended because crop injury may occur.

Mode of Action:

Treflan controls susceptible weeds by killing seedlings as they germinate. It does not control established weeds.

Precautions:

1. **Treflan will not control trifluralin tolerant green and yellow foxtail (wild millet). Trifluralin tolerant green foxtail populations have built up because trifluralin has been repeatedly used for many years as the major herbicide in a field. Populations of green foxtail tolerant to trifluralin herbicides have appeared in some areas of Saskatchewan. For further information regarding weed resistance to herbicides refer to page 9.**
2. **Drought conditions in the year prior to seeding rotational crops such as wheat, may result in higher levels of Treflan in the soil. To reduce the possibility of injury to rotational crops, seed the crops shallow into a warm, moist seedbed**.
3. DO NOT use on oats, rye, triticale or forage grasses.
4. Wheat and barley will likely be injured if seeding through a treated layer or into a deeply incorporated layer of Treflan.
5. DO NOT apply to peat or muck soils, wet soils, soils in poor working condition or soils which contain more than 15% organic matter.
6. Oats, canary seed and forage grasses should not be grown in rotation following a Treflan treated crop.
7. Used as directed, and under normal conditions, Treflan will not harm the treated crop. However, seedling disease, cold weather, deep planting, excessive moisture, high salt concentration or drought may weaken crop seedlings and increase the risk of damage resulting in delayed crop development or reduced yields.
8. If allowed to freeze. Treflan liquid must be warmed to 15 C for 24 hours and shaken well before use.
9. With Treflan granules, avoid concentrating the material in narrow bands. Use a properly calibrated granule applicator that will apply the Treflan granules uniformly.
10. There are no grazing restrictions.

Mixing:

1. Mix TREFLAN EC at 1.1 L/ha (0.45 L/ac) on light soils and 1.5 L/ha (0.6 L/ac) on medium to heavy soils with AVADEX BW (liquid formulation) at 3.5 L/ha (1.4 L/ac) in **wheat** or 3.5-4.25 L/ha (1.4-1.7 L/ac) in **barley** for control of wild oats and green foxtail (wild millet). Use only on fields free of trash. Apply in 100 L of water/ha (40 L/ac) after seeding and incorporate with a double harrowing at right angles. Seed should be placed 5-7.5 cm (2-3 in.) deep.
2. Mix TREFLAN EC at 1.5-2.0 L/ha (0.6-0.8 L/ac) with AMIBEN at 9.25 L/ha (3.7 L/ac) to control wild mustard, stinkweed, and Treflan susceptible weeds in **sunflowers**. Use the lower rate of Treflan on sandy soils. Apply in the spring before planting using a minimum of 100 L of water/ha (40 L/ac). Incorporate immediately according to recommendations for Treflan in oilseed crops. Field experience indicates that very hard water may cause compatability problems with AMIBEN.
3. For broadleaf and grassy weed control in **fababeans** mix TREFLAN EC with metribuzin. Apply fall or spring (before planting) in 100 L of water/ha (40 L/ac) and incorporate immediately following the

recommendations for Treflan incorporation. For fall application mix TREFLAN EC at 2.0-2.6 L/ha (0.8-1.1 L/ac) with;

(a) LEXONE DF at 400-550 g/ha (160-220 g/ac) or

(b) SENCOR 75 DF at 550 g/ha (220 g/ac) or

(c) SENCOR 500 at 850 mL/ha (340 mL/ac).

For spring application mix TREFLAN EC at 1.5-2.0 L/ha (0.6-0.8 L/ac) with;

(d) LEXONE DF at 350-550 g/ha (140-220 g/ac) or

(e) SENCOR 75 DF at 375-550 g/ha (150-220 g/ac) or

(f) SENCOR 500 at 550 mL/ha (220 mL/ac).

4. Mix TREFLAN EC with SENCOR 500 or SENCOR 75 DF for grassy and broadleaf weed control, including stinkweed and wild mustard, in **triazine tolerant canola**. Apply fall or spring (before planting) in 100 L of water/ha (40 L/ac) and incorporate immediately following the recommendations for Treflan incorporation.

   (a) For spring application mix TREFLAN at 1.5 L/ha (0.6 L/ac) with SENCOR 500 at 425- 550 mL/ha (170-220 mL/ac) or SENCOR 75 DF at 275-375 g/ha (110-150 g/ac) on light soils with less than 6% organic matter. On medium or heavy soils with 6-15% organic matter apply TREFLAN at 2.0 L/ha (0.8 L/ac) with SENCOR 500 at 550-850 mL/ha (220-340 mL/ac) or SENCOR 75DF at 375-550 g/ha (150-220 g/ac).

   (b) For fall application mix TREFLAN at 2.0 L/ha (0.8 L/ac) with SENCOR 500 at 550-700 mL/ha (220-280 mL/ac) or SENCOR 75 DF at 375-475 g/ha (150-190 g/ac) on light soils with less than 6% organic matter. On medium or heavy soils with 6-15% organic matter apply TREFLAN at 2.6 L/ha (1.1 L/ac) with SENCOR 500 at 700-850 mL/ha (280-340 mL/ac) or SENCOR 75 DF at 475-550 g/ha (190-220 g/ac).

   NOTE: SENCOR rate varies with soil organic matter; the higher the organic matter the higher the rate of Sencor required. Refer to table below.

5. Treflan EC may be mixed with liquid nitrogen fertilizer (eg. 28-0-0) for application. Refer to product label for instructions.

   Note: Speeds in excess of 8 km/h (5 mph) will result in excessive pulverization and trash reduction leaving fields susceptible to erosion. The maximum recommended tillage depth for Saskatchewan is 10 cm (4 in.). Fall application is not recommended on soils where a lack of trash cover combined with the required incorporation could result in soil erosion.

% Organic Matter	**Spring**		**Fall**	
	Sencor 500	**Sencor 75DF**	**Sencor 500**	**Sencor 75DF**
2-3	425 mL/ha	275 g/ha	550 mL/ha	375 g/ha
3-6	550 mL/ha	375-440 g/ha	700 mL/ha	475 g/ha
6-10	550-850 mL/ha	400-550 g/ha	700-850 mL/ha	475-550 g/ha
10-15	850 mL/ha	550 g/ha	850 mL/ha	550 g/ha

On soils with 10% organic matter and higher, broadleaf control may not be adequate.

Always add Sencor to the spray tank first. Continuous agitation is required throughout the mixing and spraying operations. FOLLOW ALL LAND PREPARATION, MIXING, SPRAYING, INCORPORATION DIRECTIONS AND PRECAUTIONS AS OUTLINED ON THE SENCOR AND TREFLAN LABELS. THIS TANK-MIX IS FOR USE ONLY ON TRIAZINE TOLERANT CANOLA. NON-TRIAZINE TOLERANT CANOLA WILL BE KILLED BY THIS TANK-MIX.

Activity: 400 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates of Product Fall	 Spring
Canola, sunflowers, peas mustard, fababeans, dry beans (field, kidney)	2.75-3.5 L/ha (1.1-1.4 L/ac)	2.0-2.75 L/ha (0.8-1.1 L/ac)
Barley, wheat	Not Recommended	1.4-2.1 L/ha (0.57-0.85 L/ac)

Summer Application: Canola only - 4.25 L/ha (1.70 L/ac).

At 2.0-2.75 L/ha one 22.7 litre container treats 11.4-8.3 ha (28-20.4 ac).

Weeds Controlled: Wild oats, green and yellow foxtail (wild millet), barnyard grass, wild buckwheat, cow cockle, redroot pigweed, lamb's-quarters, Russian thistle, chickweed, purslane, knotweed, Persian darnel.

Note: Rates recommended for barley and wheat will control green and yellow foxtail only.

Application and Timing:

1. Use the lower rate on light sandy soils or soils with less than 6% organic matter. Use the higher rate on heavier soils with higher organic matter.
2. Do not apply to peat or muck soils, wet soils, soils in poor working condition or soils which contain more than 15% organic matter.
3. Fields should be cultivated to destroy existing growth before applying Triflurex liquid. When applying to stubble fields, chop and thoroughly mix crop residues into the soil to a depth of 10 cm (4 in.). Disc type implements provide best results.
4. Apply in 100 L of water/ha (40 L/ac).

Spring - apply and incorporate immediately, in the same operation if possible. Do not delay incorporation more than 8 hours after application.

Fall - apply between September 1 and freeze-up. Incorporate immediately, in the same operation if possible. The second incorporation may be delayed until spring. If both incorporations are done in the fall, shallow tillage is required in the spring before planting.

Summer - apply and incorporate immediately, between June 1 and September 1. Do not delay incorporation more than 8 hours after application. Second and subsequent incorporations may be done any time prior to soil freeze-up.

Incorporation:

For Oilseed Crops

Incorporate immediately. The first incorporation is best done in combination with the application operation and should not be delayed more than 8 hours after application. Two operations at right angles are required. When applied in the fall, the second incorporation can be delayed until spring. When both incorporations are done in the fall, a shallow cultivation is required in the spring prior to planting.

Use a tandem disc, discer or vibrashank cultivator set to cut 7.5-10 cm (3-4 in.) deep. Operate disc implements at 7-10 km/h (4.3-6.2 mph) and cultivators at 8-10 km/h (5-6.2 mph). Rod-weeders, harrows or hoe-drills will not properly incorporate Triflurex.

For Cereals - Spring application only for control of green foxtail (wild millet) in wheat and barley.

1. Seed crop 5-7.5 cm (2-3 in.) deep.
2. Apply Triflurex as soon as possible after seeding. Fields with more than 25% trash cover should not receive this treatment.
3. Shallow incorporate with two passes of diamond or tine harrows at right angles to each other. Application and first incorporation should be done in the same operation if possible. The second incorporation must be completed within 8 hours of application.

Mode of Action:

Controls susceptible weeds by killing seedlings as they germinate. It does not control established weeds.

Precautions:

1. **Triflurex will not control trifluralin tolerant green and yellow foxtail (wild millet). Trifluralin tolerant green foxtail populations have built up because trifluralin has been repeatedly used for many years as the major herbicide in a field. Populations of green foxtail tolerant to trifluralin herbicides have appeared in some areas of Saskatchewan. For further information regarding weed resistance to herbicides refer to page 9.**
2. DO NOT use on oats, rye or forage grasses.
3. Wheat and barley will likely be injured if seeded through a treated layer or into a deeply incorporated layer of Triflurex.
4. DO NOT apply to peat or muck soils, wet soils, soils in poor working condition or soils which contain more then 15% organic matter.
5. Used as directed, and under normal conditions, Triflurex will not harm the treated crop. However, seedling disease, cold weather, deep planting, excessive moisture, high salt concentration or drought may weaken crop seedlings and increase the risk of damage resulting in delayed crop development or reduced yields.
6. If allowed to freeze, Triflurex liquid must be warmed to 15 C for 24 hours and shaken well before use.
7. Fall application is not recommended on soils where a lack of trash cover combined with the required incorporation could result in soil erosion.
8. There are no grazing restrictions.
9. Oats, canary seed and forage grasses should not be grown in rotation following a Triflurex treated crop.

Mixing:

1. Mix TRIFLUREX at 1.4 L/ha (0.57 L/ac) on light soils and 2.1 L/ha (0.85 L/ac) on medium to heavy soils with AVADEX BW (liquid formulation) at 3.5 L/ha (1.40 L/ac) in **wheat** or 3.5-4.25 L/ha (1.40-1.70 L/ac) in **barley** for control of wild oats and green foxtail (wild millet). Use only on fields free of trash. Apply in 100 L of water/ha (40 L/ac) after seeding and incorporate with a double harrowing at right angles. Seed should be placed 5-7.5 cm (2-3 in.) deep.

   Note: Speeds in excess of 8 km/h (5 mph) will result in excessive pulverization and trash reduction leaving fields susceptible to erosion. The maximum recommended tillage depth for Saskatchewan is 10 cm (4 in.). Fall application is not recommended where a lack of trash cover combined with the required incorporation could result in soil erosion.

Triumph Plus (fenoxaprop-ethyl/MCPA/thifensulfuron)* Hoechst

Activity: fenoxaprop-ethyl 90 g active ingredient/litre (HOE 33171)
MCPA ester 500 g active ingredient/litre
thifensulfuron 75% dry flowable (PLUS)

Registered Uses:

Crops	**Recommended Rate of Product**
Hard Red Spring Wheat	HOE 33171 - 2.2 L/ha (.9 L/ac) MCPA ester - 0.84 L/ha (.34 L/ac) PLUS - 20 g/ha (8 g/ac)

At the recommended rate, one case of Triumph Plus treats 8.1 ha (20 ac).

Weeds Controlled: Wild Oats, green and yellow foxtail (wild millet), annual sunflower, ball mustard, burdock, cocklebur, field horsetail, flixweed, hoary cress, kochia, mustards (except dog and green tansy), plantain, prickly lettuce, ragweeds, Russian pigweed, shepherd's-purse, vetch, wild radish, corn spurry, cow cockle, green smartweed, hemp-nettle, lady's-thumb, lamb's-quarters, redroot pigweed, Russian thistle, stinkweed, volunteer canola, wild mustard, chickweed, wild buckwheat.

Application:

1. For ground application only. Application should be made in a minimum of 100 L of water/ha (40 L/ac) at a pressure of 275 kPa (40 psi), and a groundspeed of 6 to 8 km/h (4 to 5 mph). The use of 80° or 110° stainless steel flat fan nozzles is recommended for optimal spray coverage. Better canopy penetration will be achieved if spray boom is tilted 45° forward.
2. MCPA and PLUS **must** be tank-mixed at the recommended rate with HOE 33171 or crop damage and/or a reduction in grassy and broadleaf weed control will result.

Timing:

1. Although registered in the 2-leaf through flag-leaf stage of growth, it is recommended that treatment at the 3 to 4 leaf stage of both crop and weeds usually combines maximum crop tolerance and weed susceptibility.
2. Apply when the grassy weeds are in the 1-6 leaf stage (including tillers).
3. Apply to the following broadleaf weeds in the 2-4 leaf stage: Annual sunflower, ball mustard, burdock, cocklebur, field horsetail[1], flixweed[2], hoary cress[1], kochia, mustards (except dog and green tansy), plantain[1], prickly lettuce, ragweeds, Russian pigweed, shepherd's-purse[2], vetch, and wild radish.

   Apply to the following broadleaf weeds when less than 10 cm (4 inches) tall or across: Corn spurry, cow cockle, green smartweed, hemp-nettle, lady's-thumb, lamb's-quarters, redroot pigweed, Russian thistle, stinkweed[2], volunteer canola and wild mustard.

   For chickweed apply in the 1 - 6 leaf stage and for wild buckwheat in the 1 - 3 leaf stage.

[1] Top growth control only

[2] Spring seedlings only

Mode of Action:

HOE 33171 is a contact and systemic herbicide that controls annual grassy weeds. Symptoms include reduced leaf growth and yellowing of the treated plants within 1-3 days. Chlorosis progresses and death of the plant occurs in 14-21 days after application.

MCPA is a systemic herbicide for broadleaf weeds which is translocated causing rapid undifferentiated growth. This usually results in the death of susceptible plants.

PLUS rapidly inhibits the growth of susceptible weeds. Typical symptoms (discolouration) of dying weeds may not be noticeable for 1 to 3 weeks after application. Speed of activity depends on growing conditions and weed susceptibility. Cold dry conditions could delay activity.

Precautions:

1. **Some naturally occurring populations of certain weeds listed on this label will not be controlled by Plus, Refine, Ally, Muster or Glean. These populations are able to survive a use rate several times higher than needed to control susceptible populations. Triumph Plus will delay the selection for resistant populations of weeds that are normally controlled or suppressed by both MCPA and Plus. To delay the selection for resistant populations of weeds not controlled by MCPA, rotate the use of Triumph Plus, Refine, Ally, Muster, and Glean with other herbicides effective on these weeds. Avoid use of Triumph Plus, Refine, Ally, Muster and Glean repeatedly in the same field. For further information regarding weed resistance to herbicides refer to page 9.**
2. DO NOT apply to durum wheat, barley or tame oats.

3. DO NOT apply to wheat underseeded to forages.
4. DO NOT apply by aircraft. Do not allow spray or vapour to drift onto other crops.
5. DO NOT graze treated fields prior to harvest.
6. DO NOT apply within 15 m of a body of water or wetland area.
7. Sprayer Cleanup
   - (a) Drain tank and flush tank, boom and hoses with clean water for a minimum of 10 minutes. Visually inspect tank to assure removal of all visible residues. If necessary, repeat step 1. Do not clean sprayer near well or water source or near to desirable vegetation.
   - (b) Fill tank with clean water while adding 1 litre household ammonia (containing a minimum 3% ammonia) per 100 litres of water. Flush solution through boom and hoses, and then add more water to completely fill tank. Allow to sit for 15 minutes with agitation. Again flush the hoses, boom and nozzles with the cleaning solution and drain tank.
   - (c) Remove the nozzles and screens and clean separately in a bucket containing cleaning agent and water.
   - (d) Repeat step b.
   - (e) Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and booms.
8. Read label of detailed precautions and follow all label directions.

Mixing:

1. (a) Ensure that the spray tank is thoroughly clean.
   - (b) Fill the tank half full with clean water and start agitation or bypass system.
   - (c) Slowly add the correct amount of PLUS (container #1) to the spray tank. Agitate thoroughly until PLUS is completely in suspension.
   - (d) Add the correct amount of MCPA (container #2) and continue agitation.
   - (e) Add the correct amount of HOE 33171 (two containers marked #3) and continue agitation.
   - (f) Triple rinse the emptied containers into the spray tank.
   - (g) Add the remaining amount of water while agitation continues. Spray out immediately. Spray mixture should not be left in tank overnight.
   - (h) On repeat loads, prepare a PLUS (container #1) slurry in water by slowly adding the correct amount of PLUS to 20 litres of water, and add to spray tank. Agitate thoroughly until PLUS is completely in suspension. Repeat steps d, e, f and g.
2. DO NOT tank-mix with any other additives, surfactants, pesticides or fertilizers.

* This product has a temporary registration. Additional technical information is required in relation to its use. Be advised that the current label may be revised. Directions for use and cautionary statements should be carefully followed.

Tropotox Plus (MCPB + MCPA 15:1) — Rhone Poulenc

Note: This product is recommended for use on cereals underseeded to seedling clovers (except sweet clover).

Activity: 400 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates of Product**
Peas, wheat (spring, durum), barley, oats, rye, seedling clover (white, alsike, red), pastures	2.75-4.25 L/ha (1.10-1.70 L/ac)

At 2.75-4.25 L/ha two 8 litre containers treat 5.8-3.8 ha (14.4-9.3 ac).

Weeds controlled at 2.75 L/ha: Mustards (wild, ball, wormseed), stinkweed, lamb's-quarters.

Weeds controlled at 4.25 L/ha: Redroot pigweed, ragweed, shepherd's-purse, volunteer canola and suppression of hemp-nettle and annual sow-thistle. Top growth control of wild radish, bull thistle, Canada thistle, curled dock, plantains, perennial sow-thistle, field bindweed and horsetail.

Application and Timing:

1. Apply in 150-200 L of water/ha (60-80 L/ac) when the legumes are in the 1-4 true leaf stage and when the cereal is between the 2-leaf and flag leaf stages.
2. Apply when peas have 3-6 expanded leaves.
3. Apply in pastures after grazing or cutting when weeds are at a susceptible stage.

Mode of Action:

Mode of action is similar to 2,4-D and MCPA.

Precautions:

1. DO NOT use on sweet clover.
2. Rainfall before foliage has dried from spraying may decrease activity.
3. DO NOT freeze.
4. There are no grazing restrictions.

Mixing:

1. DO NOT mix TROPOTOX PLUS with any other pesticides, fertilizers or spray adjuvants.

Activity: 240 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates of Product**
Established alfalfa grown for seed	2.1-4.2 L/ha (0.84-1.68 L/ac)

At 2.1-4.2 L/ha one 10 litre container treats 4.2-4.8 ha (5.9-11.9 ac).

Weeds controlled: Dandelion, quackgrass, sow thistle

Application:

1. Apply in a minimum of 200 L of water/ha (80 L/ac).
2. Use the lower rate on medium textured soils low in organic matter.

Timing:

Apply only to alfalfa grown for seed that has been established for at least 18 months, in the late fall or early spring when the alfalfa is dormant.

Mode of Action:

A systemic herbicide readily absorbed through the roots and foliage and translocated upwards. Inhibits photosynthesis.

Precautions:

1. DO NOT graze the treated crop or harvest for hay.
2. DO NOT apply to soils with less than 1% organic matter.
3. DO NOT apply to gravelly or rocky soils, exposed sub soils or sand. Crop injury may occur in fields where alfalfa root growth has been restricted by hard pans or other physical barriers to root growth.
4. DO NOT treat fields that are to be planted to other crops within 24 months. Do not seed any crop following alfalfa that has been treated with Velpar L until a successful field bioassay* shows that the crop in question may be grown safely.
5. If fall irrigation and/or burning is to be carried out, do not apply Velpar L until after completion of these operations.
6. DO NOT apply to frozen soils.
7. DO NOT freeze.

*IMPORTANT - A field bioassay involves growing teststrips of the crop(s) intended for production the following year in a field previously treated with Velpar L. Crop response will indicate whether or not to rotate to the crop(s) used in the test strip. See Field Bioassay section of the label. Failure to follow these instructions could result in injury to subsequent crops.

2,4-D, MCPA

Formulation:	**g active ingredient/litre**
2,4-D Low Volatile ester	600, 700, 500
2,4-D, MCPA, amine, ester	500
MCPA sodium salt	300
MCPAK (potassium salt)	400

Registered Uses: Crops	**Recommended Rates of Product**
Wheat (spring, durum), barley, rye	2,4-D up to 1.1 L/ha (0.45 L/ac)
	MCPA up to 1.25 L/ha (0.51 L/ac)
Flax, oats	MCPA up to 1.1 L/ha (0.45 L/ac)
Peas*	MCPA amine up to 0.56 L/ha (0.23 L/ac)
	MCPA sodium salt up to 0.93 L/ha (0.37 L/ac)
Winter Wheat	2,4-D and MCPA - up to 1.1 L/ha (0.45 L/ac)
Seedling forage grasses	2,4-D amine and MCPA - up to 1.1 L/ha (0.45 L/ac)
Established forage grasses	2,4-D and MCPA - 2.2 L/ha (0.90 L/ac)
Native and Rangeland grasses	2,4-D and MCPA - up to 4.4 L/ha (1.8 L/ac)

These rates are for the amine formulations of 2,4-D and MCPA (500 active ingredient/litre). For rates of other formulations of 2,4-D and MCPA see conversion factors on page 104.

* The rate of MCPA (amine or sodium salts) recommended for use on peas in Saskatchewan is less than the labelled rate due to crop injury concerns.

Weeds Controlled by 2,4-D

Weeds Controlled:	**Recommended Rates of Product**		
	2,4-D amine 500 or LV ester 500	**2,4-D LV ester 600**	**2,4-D LV ester 700**
Very Susceptible: ball mustard, common ragweed, false ragweed, great ragweed, hare's-ear mustard, Indian mustard, lamb's-quarters, tumble mustard, wild mustard, wormseed mustard.	0.56-0.84 L/ha (0.23-0.34 L/ac)	0.46-0.7 L/ha (0.19-0.28 L/ac)	0.4-0.6 L/ha (0.16-0.24 L/ac)
Susceptible: burdocks (seedlings), cocklebur, flixweed (fall rosettes and spring seedlings), goat's-beard (seedlings), kochia, narrow-leaved hawk's-beard (fall rosette and spring seedlings), plaintain, prickly lettuce, Russian pigweed, shepherd's-purse (fall rosettes and spring seedlings), stinkweed (fall rosettes and spring seedlings), sunflower, sweet clover, wild radish.	0.84-1.1 L/ha (0.34-0.45 L/ac)	0.7-0.91 L/ha (0.28-0.37 L/ac)	0.6-0.78 L/ha (0.24-0.32 L/ac)
Intermediate: alfalfa*, annual sow-thistle, biennial wormwood , bluebur, blue lettuce* , Canada thistle*, curled dock*, dandelion*, field bindweed*, field peppergrass , flixweed (spring rosettes), gumweed, hairy galinsoga, hedge bindweed*, hoary cress* , leafy spruge* , oak-leaved goosefoot, perennial sow-thistle* , pineappleweed , prostrate amaranth, purslane, redroot pigweed, Russian knapweed* , Russian thistle, shepherd's-purse (spring rosette), stinkweed (spring rosette), tumble pigweed, volunteer canola, volunteer mustard.	1.25-1.7 L/ha (0.51-0.69 L/ac)	1.0-1.4 L/ha (0.4-0.57 L/ac)	0.89-1.12 L/ha (0.36-0.49 L/ac)

Weeds Controlled by MCPA

Weeds Controlled:	**Recommended Rates of Product**		
	MCPA Amine or Ester 500	**MCPA K-Salt**	**MCPA Na-Salt**
Susceptible: ball mustard, burdocks (seedling), cocklebur, common plaintain, common ragweed, false ragweed, field horsetail*, flixweed (fall rosettes & spring seedling), giant ragweed, hare's-ear mustard, Indian mustard, kochia, lamb's-quarters, prickly lettuce, Russian pigweed, shepherd's-purse (fall rosette and spring seedling), stinkweed (fall rosette and spring seedling), sunflower (annual), tumble mustard, wild mustard, wild radish, wormseed mustard	0.7-1.1 L/ha (0.28-0.45 L/ac)	0.88-1.38 L/ha (0.35-0.56 L/ac)	1.2-1.8 L/ha (0.47-0.75 L/ac)
More Resistant: American dragonhead, annual sow-thistle, biennial wormwood, bluebur, blue lettuce*, Canada thistle*, dandelion*, docks*, dog mustard, field peppergrass, goat's-beard, hairy galinsoga, hemp-nettle*, hoary cress*, oak-leaved goosefoot, perennial sow-thistle*, redroot pigweed	1.25-1.7 L/ha (0.51-0.69 L/ac)	1.56-2.1 L/ha (0.63-0.85 L/ac)	2.1-2.8 L/ha (0.84-1.1 L/ac)

* topgrowth control only
Use the higher recommended rate

Application and Timing:

A. General

1. In cereals, apply in 100 L of water/ha (40 L/ac). In flax, use 100-165 L of water/ha (40- 65 L/ac).
2. Use the lower rates within the given ranges when weeds are young (2-4 leaves) and growing rapidly, under good moisture conditions. Use the higher rate in each case for more advanced stages, in dry or cool weather conditions, or for very heavy infestations.

B. Wheat (spring, durum), barley, rye

1. These crops can be sprayed safely from the 4-leaf stage up to just before the flag-leaf stage with rates of 2,4-D[1] up to 1.1 L/ha (0.45 L/ac) and MCPA[1] at .84-1.25 L/ha (0.34-0.51 L/ac). MCPA at rates of 0.70 L/ha (0.28 L/ac) and below can be applied after the 2-leaf stage of the crop.
2. Treatment at the 4-leaf stage will usually combine best crop tolerance and maximum weed susceptibility.
3. Treatment with 2,4-D ester before or during the 3-leaf stage in wheat or barley will likely cause leaf, stem and head deformities and may reduce yield up to 10%. If these crops must be treated before the 4-leaf stage, use the amine formulation of 2,4-D or MCPA.
4. Rates higher than those given in (1) may be necessary when the crop is heavily infested with semi-tolerant weeds. These higher rates may cause some crop injury particularly if 2,4-D ester is used. However, the injury may be more than offset by increased yield due to reduced weed competition. Use of an amine rather than an ester will reduce the risk of crop injury.

C. Oats

1. 2,4-D (especially the ester formulation) is not recommended on oats.
2. Oats can be treated safely with MCPA[1] at up to 1.1 L/ha (0.45 L/ac) from the 1-leaf stage up to just before the flag-leaf stage.
3. If 2,4-D must be used, apply the amine formulation at up to 0.98 L/ha (0.40 L/ac) from the 1-leaf to the 3-leaf stage or from the 6-leaf stage to just before the flag-leaf stage.
4. If heavy infestations of weeds resistant to 2,4-D or MCPA amines are present, use herbicides or mixtures containing Banvel or Pardner (bromoxynil) rather than 2,4-D ester.

D. Flax

1. 2,4-D is not recommended on flax. Use MCPA amine applied after the crop is 5 cm (2 in.) tall and before bud formation.

2. Rates of MCPA ester of 0.84 L/ha (0.34 L/ac) or more, MCPA amine of 0.98 L/ha (0.40 L/ac) or more or MCPA sodium salt of 1.9 L/ha (0.77 L/ac) or more will usually cause some delay in maturity. Any potential yield reductions should be offset by increased yields due to better weed control.

E. Peas

1. 2,4-D is NOT recommended on peas.
2. Treat when the vine length is less than 15 cm (6 in.) and peas are in the 2-5 leaf stage.
3. Use MCPA amine or sodium salt in 165-220 L water/ha (65-80 L/ac).
4. Phenoxy herbicides may cause maturity delays in peas.

F. Winter Wheat

1. Winter annuals may be sprayed in fall with rates of 2,4-D[1] or MCPA[1] from 0.84-1.1 L/ha (0.34-0.45 L/ac). Use the higher rate for harder to kill weeds such as Canada thistle, perennial sow-thistle and narrow-leaved hawk's-beard. Crop injury may occur, however, the injury may be more than offset by increased yield due to reduced weed competition. CAUTION: This is not a registered treatment, any such use is entirely at the risk of the user.
2. In spring 2,4-D[1] or MCPA[1] can be sprayed up to 1.1 L/ha (0.45 L/ac) from the time the crop commences growth until just before the flag-leaf stage. Rates higher than 1.1 L/ha (0.45 L/ac) may be necessary for control of semi-tolerant weeds and over-wintered annuals. However, the crop injury may be more than offset by increased yield due to reduced weed competition. Use of an amine rather than an ester will reduce the risk of crop injury.

G. Forages grasses

1. Seedling grasses may be sprayed from the 3-leaf stage to just before the shot-blade stage. Apply in 100-165 L of water/ha (40-65 L/ac) in bromegrass, creeping red fescue, crested wheatgrass, intermediate wheatgrass and Russian wild ryegrass. Do not use 2,4-D ester.
2. Established grasses may be sprayed in the spring up to the shot-blade stage or in the fall after harvest. Apply in 100-165 L of water/ha (40-65 L/ac).

Mode of Action:

2,4-D and MCPA are translocated and cause rapid undifferentiated growth which usually results in death of susceptible plants.

Precautions:

1. Both the ester and amine formulations will cause floret sterility and severe yield losses if applied during the flag-leaf to fully headed stages of cereals.
2. DO NOT graze for 24 hours.
3. DO NOT graze dairy cattle for 7 days.
4. DO NOT apply ester formulations if rainfall is expected within 2 hours.
5. DO NOT apply amine formulations if rainfall is expected within 4 hours.
6. DO NOT apply Sodium or Potassium formulations of MCPA if rainfall is expected within 6 hours.
7. Not all brands of phenoxy herbicides are registered for the same uses. Refer to product labels for complete details.

Mixing:

1. Phenoxy herbicides may be tank-mixed with a number of other herbicides. Use mixtures only when they are registered and recommended for use. Insure that the proper formulation of phenoxy herbicide is used with the product considered for mixing.
2. ESTEMINE MCPA at 1.0 L/ha (0.40 L/ac) may be tank-mixed with 28-0-0 liquid fertilizer for spring application on winter wheat and fall rye. Apply early in spring when crop commences growth, until just before the flag-leaf stage. Consult fertilizer recommendations in regard to the most efficient method of applying nitrogen fertilizers.

Formulations	**Risk of Vapor Drift**	**Activity on Weeds**	**Risk of Crop Injury**	**Risk of Rain Losses**	**Storage Requirements**
Low Volatile Ester	Medium	Fast	Medium	Low	Can be frozen-warm and agitate
Amine	Very Low	Medium	Low	Medium	Do not freeze
Salts	Very Low	Slow	Very Low	High	Do not freeze

To convert from 500 g active ingredient/litre to other activities multiply by the following:

300 g active ingredient/litre - 1.67
400 g active ingredient/litre - 1.25
512 g active ingredient/litre - .98
600 g active ingredient/litre - .83
700 g active ingredient/litre - .71
800 g active ingredient/litre - .63

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[1] These rates are for the amine formulations of 2,4-D and MCPA (500 active ingredient/litre). For rates of other formulations of 2,4-D and MCPA see conversion factors above.

Plant Growth Regulators

Plant Growth Regulators (PGRs) are chemicals used to alter the growth of a plant in some manner. They are classified as pesticides and are regulated by the same legislation that applies to herbicides, insecticides and fungicides. Therefore, they must be registered under the Pest Control Products Act before they can be legally sold in Canada. The only PGR available for sale in Western Canada is ethephon (Cerone). It is registered for use as an anti-lodging agent in barley. Use of an anti-lodging agent such as Cerone should be considered only in fields of these varieties which have a high yield potential and a high potential for lodging.

In Saskatchewan, barley crops being produced in the parkland area and in irrigated areas where maximum yields are being attempted are the most likely to require an anti-lodging agent. Crop varieties vary significantly in their ability to withstand lodging and this should also be taken into account when selecting varieties for use in high yield management programs.

Cerone (ethephon)

Rhone Poulenc

Activity: 480 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates of Product**
Barley: 2 row varieties	0.5-0.75 L/ha (0.2-0.3 L/ac)
6 row varieties	0.5-1.0 L/ha (0.2-0.4 L/ac)

At 0.5-1.0 L/ha one 5 litre container treats 5-10 ha (12.5-25 acres).

Control: Cerone will reduce lodging in barley.

Application:

1. Thorough and uniform coverage of upper leaves is essential for optimal results.
2. Apply in 110 L of water/ha (45 L/ac) when using ground sprayers. Be certain the boom is high enough above the crop canopy to give proper coverage.
3. For aerial applications, apply a minimum of 30 L of water/ha (12 L/ac) or more.
4. Adjust rates according to environmental and growth conditions. Use the higher rates on crops that are highly fertilized (more than 100 kg/ha of total available nitrogen), have ample moisture (more than 25 cm (10 in.) of rainfall) or 35 cm (14 in.) of irrigation during the growing season), and are prone to lodging. **Use the lower rates of Cerone unless lodging conditions are expected to be severe.**

Timing:

1. **Correct timing is essential for successful results and to ensure crops safety.**
2. Apply after the flag leaf has begun to emerge until the swollen-boot stage (Zadok's growth stages 37-45). Do not apply once awns begin to show. Consult Cerone label for staging details.

Mode of Action:

1. The activity of Cerone is primarily through contact action. Thorough spray coverage is essential for satisfactory results.
2. Cerone reduces lodging by reducing the extension of the upper internodes of the plant. Cerone will typically reduce the height by 2-15 cm (1-6 in.). It will also reduce necking and increase straw strength.
3. Under certain conditions, a delay in crop maturity may occur. This is normally not greater than 5 days and is generally less than that caused by lodging.

Precautions:

1. **DO NOT apply to crops which are under any type of stress such as drought, excessive moisture, excessive heat, disease or to crops which have already lodged. Applications to stressed crops may result in severe yield reductions.**
2. DO NOT apply if rainfall is expected within 5 hours.
3. DO NOT allow mixed solution to stand overnight.
4. DO NOT apply within 35 days of harvest.
5. Clean spray equipment thoroughly immediately after spraying. Cerone spray deposits, when left on aircraft acrylic plastic type windshields may react forming an opaque film or spots. Rinse windshields with water immediately after each tankload of Cerone has been applied.
6. Treated straw may be fed to livestock.

Mixing:

DO NOT mix CERONE with any other pesticides, surfactants or wetting agents.

Weed Control in Forages

Tame Forages - Refer to the chart on the previous page to determine the herbicides that can be used on your forage crop. Then refer to the appropriate product page for information on the use of the product(s) which can be used in your situation.

Pasture Renovation - Apply Roundup to control or suppress existing vegetation for zero-tillage seeding of legumes into established sod for pasture renovation in the black soil zone. Delay spraying until the existing vegetation is at least 20 cm (8 in.) in height and the maximum number of shoots have emerged. Application can be made immediately before, during or after seeding but before crop emergence. Refer to the Roundup label for rates of application required for the control of specific weeds.

Rangeland and Native Pastures - The carrying capacity and quality of forage on range or native pasture can be increased by controlling weeds. The use of herbicides is justified when used in combination with proper grazing practices, where the control or reduction of undesirable weeds results in an economic increase of desirable forage.

General Considerations

Unless specified otherwise, brush control herbicides should be applied during June. Optimum time to spray occurs after the leaf blade has fully expanded. As the growing season progresses, leaves develop thicker cuticles (outer cell layer on a leaf) which impede the entry of herbicides into the leaves. Thicker cuticles develop under high temperatures and low relative humidity. The lower the relative humidity, the more rapid the drying rate of a herbicide drop on a leaf. This reduces the amount of time for a herbicide to penetrate a leaf which reduces the effectiveness of a herbicide. **NOTE:** Brush taller than 2 m (6 ft.) should be cut and the regrowth sprayed.

Most broadleaf plants are easier to kill with 2,4-D type herbicides during a period of rapid growth. Often control is less effective during hot dry weather when there is a soil moisture deficit. Because growing and environmental conditions vary from year to year, the effectiveness of a herbicide application varies. Often a single spray application will not control perennial rangeland weeds. Herbicide treated areas must be observed after spraying each year for regrowth. Depending on the amount of regrowth, one to several retreatments may be required. For most range weeds, control depends upon adequate competition from established grasses. Legumes will be damaged or killed by the treatments listed for brush and perennial weed control. Because there is a possibility that plants poisonous to livestock may be grazed more readily after 2,4-D treatment, suitable precautions should be taken when such plants are present. For grazing and feeding restrictions of individual products refer to the table on page 123. Refer to product labels for precautions, grazing restrictions, general use information and specific application instructions before using product. NOTE: Not all brands of 2,4-D are registered for the same uses.

Select the type of herbicide application which best fits your weed problem. The herbicide application types are:

1. **Foliage Treatment:** Apply herbicide(s) in 110 to 220 L water/ha (45 to 90 L/ac) with ground sprayers and at 35 L of water or oil/ha (15 L/ac) with an aircraft to foliage when leaves are fully expanded.
2. **Stem-Foliage Treatment:** Apply herbicide(s) to foliage and stem to the point of run-off. The rate of herbicides specified is usually added to 1000 L of water. Volume of spray mixture applied per hectare will vary according to height and density of brush.
3. **Spot Treatment:** For spot control, herbicides should be applied in sufficient water for uniform and complete coverage, however, do not spray to the point of run-off. Amitrol-T, Laredo, Wrangler and Roundup are non-selective herbicides and will kill desirable vegetation. Tordon 22K is highly potent, persistent and water soluble. It may be used for spot treatment when applied by a licenced pesticide applicator. The land area of a spot treatment for Tordon 22K should not exceed 5% of the total land area in a field in any one year. Spot treatment with Tordon 22K may temporarily stunt the growth of desirable grasses. NOTE: 100 square metres (sq.m.) is equal to 1076 square feet.

Herbicides for Rangeland and Native Pastures

Weed Species	Treatment	Herbicide (recommended rate of product)
Absinth	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac)
	Spot	Roundup, Laredo, Wrangler 75-125 mL in 5.0 L water per 100 sq. m. (1076 sq. ft.)
Alders	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac)
	Stem-Foliage	Banvel (480 g/L) 2.1 L + 2,4-D LV ester 500 or amine 500 4.0 L
Trembling Aspen (Aspen Poplar)	Foliage	Banvel (480 g/L) 3.25 L/ha (1.32 L/ac) + 2,4-D LV ester 500 or amine 500 4.4 L/ha (1.82 L/ac)
	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac)
	Stem-Foliage	Banvel (480 g/L) 2.1 L + 2,4-D LV ester 500 or amine 500 4.0 L
	Stem-Foliage	Roundup, Laredo, Wrangler 1 L in 100 L of water
Biennial Wormwood	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac)
Balsam Poplar	Stem-Foliage	Banvel (480 g/L) 2.1 L + 2,4-D LV ester 500 or amine 500 4.0 L
	Stem-Foliage	Roundup, Laredo, Wrangler 1 L in 100 L of water
Canada thistle	Foliage	2,4-D LV ester 500 2.2 to 4.4 L/ha (0.90-1.82 L/ac)
		Banvel (480 g/L) 2.1 L/ha (0.85 L/ac)
		Banvel (480 g/L) 2.1 L/ha (0.85 L/ac) + 2,4-D LV ester 500 or amine 500 2.2 L/ha (0.9 L/ac)
	Spot	Amitrol-T 375 mL in 25 L of water per 100 sq. m. (1076 sq. ft.)
		Roundup, Laredo, Wrangler 50-70 mL in 5.0 L water per 100 sq. m. (1076 sq. ft.)
		Tordon 22K 45 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Chokecherry	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac)
Curled Dock	Spot	Roundup, Laredo, Wrangler 75-125 mL in 5.0 L water per 100 sq. m. (1076 sq. ft.)
Diffuse Knapweed	Spot	Banvel (480 g/L) 4.6 L/ha (1.86 L/ac)
		Tordon 22K 22 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Field Bindweed	Foliage	2,4-D LV ester 500 2.2 to 4.4 L/ha (0.9-1.82 L/ac)
		Banvel (480 g/L) 2.1 L/ha (0.85 L/ac)
		Banvel (480 g/L) 2.1 L/ha (0.85 L/ac) + 2,4-D LV ester 500 or amine 500 2.2 L/ha (0.9 L/ac)
	Spot	Roundup, Laredo, Wrangler 75-125 mL in 5.0 L water per 100 sq. m. (1076 sq. ft.)
		Tordon 22K 90 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Gumweed	Foliage	2,4-D LV ester 500 2.2 L/ha (0.9 L/ac)
Hoary Cress	Spot	Amitrol-T 375 mL in 25 L of water per 100 sq. m. (1076 sq. ft.)
		Roundup, Laredo, Wrangler 75-125 mL in 5.0 L water per 100 sq. m. (1076 sq. ft.)
Leafy Spurge	Foliage	2,4-D LV ester 500 2.2 L/ha (0.9 L/ac)
	Spot	Tordon 22K 90 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Locoweeds	Foliage	2,4-D LV ester 500 4.4 to 6.8 L/ha (1.82-2.75 L/ac)[4]
Lupines	Foliage	2,4-D LV ester 500 4.4 to 6.8 L/ha (1.82-2.75 L/ac)[4]
Milk-vetches	Foliage	2,4-D LV ester 500 4.4 to 6.8 L/ha (1.82-2.75 L/ac)[5]
Milkweeds	Spot	Amitrol-T 375 mL in 25 L of water per 100 sq.m. (1076 sq. ft.)

Pasture Sage	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac) Banvel (480 g/L) 4.6 L/ha (1.86 L/ac)
	Spot	Tordon 22K 45 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Perennial Sow-Thistle	Foliage	2,4-D LV ester 500 2.2 to 4.4 L/ha (0.9-1.82 L/ac) Banvel (480 g/L) 2.1 L/ha (0.85 L/ac) Banvel (480 g/L) 2.1 L/ha (0.85 L/ac) + 2,4-D LV ester 500 or amine 500 2.2 L/ha (0.9 L/ac)
	Spot	Amitrol-T 375 mL in 25 L of water per 100 sq. m. (1076 sq. ft.) Roundup, Laredo, Wrangler 75-125 mL in 5.0 L water per 100 sq. m. (1076 sq. ft.) Tordon 22K 45 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Poverty Weed	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac) Banvel (480 g/L) 4.6 L/ha (1.86 L/ac)
	Spot	Tordon 22K 45 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Prairie Everlasting	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac)
Prairie Sage	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac)
Russian Knapweed	Spot	Tordon 22K 45 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Saskatoon	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac)
Scentless Chamomile	Spot	Tordon 22K 11 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Toadflax	Spot	Amitrol-T 375 mL in 25 L of water per 100 sq. m. (1076 sq. ft.) Roundup, Laredo, Wrangler 75-125 mL in 5.0 L water per 100 sq. m. (1076 sq. ft.) Tordon 22K 45 mL in 18 L of water per 100 sq. m. (1076 sq. ft.)
Western Snowberry (buckbrush)	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac)
	Banvel	(480 g/L) 3.65 L/ha (1.48 L/ac) + 2,4-D LV ester 500 4.4 L/ha (1.82 L/ac)
	Stem-Foliage	Banvel (480 g/L) 2.1 L + 2,4-D LV ester 500 or amine 500 4.0 L
	Stem-Foliage	Roundup, Laredo, Wrangler 1 L in 100 L of water
Roses	Foliage	Banvel (480 g/L) 3.65 L/ha (1.48 L/ac) + 2,4-D LV ester 500 or amine 500 4.4 L/ha (1.82 L/ac)
	Stem-Foliage	Banvel (480 g/L) 2.1 L + 2,4-D LV ester 500 or amine 500 4.0 L
Willows	Foliage	2,4-D LV ester 500 4.4 L/ha (1.82 L/ac)
	Stem-Foliage	Roundup, Laredo, Wrangler 1 L in 100 L of water
Silverberry (wolf willow)	Stem-Foliage	Banvel (480 g/L) 2.1 L + 2,4-D LV ester 500 or amine 500 4.0 L

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(1) Rates given for 2,4-D are for the 500 g active ingredient/litre formulation. For rates of other formulations refer to 2,4-D/MCPA section.

(2) Apply in early fall and repeat in spring.

(3) Apply in the early bud stage and retreat the same year if regrowth is sufficient. Yearly retreatment will be required.

(4) Apply in full bloom stage of growth.

(5) Apply between 13 cm stage and before full bloom.

Fall Weed Control

A. Post-emergence Herbicides

Fall weed control is an extremely important part of any tillage system. If winter annuals are not controlled in the fall or early spring, they mature beyond the susceptible period and cause substantial moisture and nutrient loss.

1. Winter Annuals

a. Summerfallow/Stubble

Stinkweed, flixweed, shepherd's-purse-Apply 2,4-D or MCPA at 0.84-1.1 L product/ha (0.34-0.45 L/ac). This treatment should be applied in 100 L of water/ha (40 L/ac) to emerged weeds **from mid-October** to freeze-up.

b. Alfalfa

Narrow-leaved hawk's-beard, stinkweed, flixweed - Apply Embutox 625 or 2,4D Butyric 400 or Cobutox to alfalfa when weeds are in the seedling rosette stage. Apply in 220 L of water/ha (90 L/ac) after the alfalfa has stopped growth but before freeze-up.

c. Winter Wheat

Winter annuals may be sprayed with rates of 2,4-D or MCPA from 0.84-1.1 L/ha (0.34-0.45 L/ac). Use the higher rate for harder to kill weeds such as Canada Thistle, perennial sow-thistle and narrow-leaved hawk's-beard. Crop injury may occur, however, the injury may be more than offset by increased yield due to reduced weed competition. **CAUTION:** This is not a registered treatment, any such use is entirely at the risk of the user.

OR

Buctril-M at 1.0 L product/ha (0.40 L/ac) when the winter wheat is in the 2-4 leaf stage to control stinkweed, flixweed and shepherd's purse.

2. Canada Thistle - Perennial Sow-Thistle

Perennial weed control should be done in the fall to minimize crop competition losses in the spring, provided the following conditions are met: There is adequate moisture to promote new active growth of the weeds and killing frost is not likely to occur within two weeks of application. Good growing conditions for at least two weeks following treatment are required for best results. It is recommended that fall treatments be applied prior to September 15.

Apply 2,4-D or MCPA at 2.2 L product/ha (0.90 L/ac) OR Estaprop at 1.9 L product/ha (0.77 L/ac) OR Target at 2.0 L product/ha (0.80 L/ac), after harvest in 100 L water/ha (40 L/ac). Allow two or three weeks after treatment before working the soil.

OR

Apply Amitrol-T at 22-25 L product/ha (8.9-10.0 L/ac) in at least 200 L water/ha (80 L/ac) (spot treatment) to actively growing plants that are 15-20 cm (6-8 in.) tall. Follow with tillage in 2-3 weeks.

OR

Apply Banvel (480 g/L) at 1.25 L product/ha (0.51 L/ac) tank-mixed with 2,4-D amine at 1.1-2.2 L product/ha (0.45-0.90 L/ac) in 100 L of water/ha (40 L/ac) OR Banvel (480 g/L) alone, at 2.5 L product/ha (1.0 L/ac) in at least 100 L water/ha (40 L/ac). Apply Banvel treatments when plants are actively growing and follow with tillage in 2-3 weeks. The use of Banvel at these rates after September 1 may result in residue carry-over that will damage the following crop. Plant only cereal crops the year after treatment.

OR

Apply Banvel (480 g/L) at 1.25 L product/ha (0.51 L/ac), tank-mixed with Roundup, Laredo or Wrangler at 1.7 L product/ha (0.69 L/ac) plus 350 mL/ha (141 mL/ac) of a non-ionic surfactant in at least 100 L water/ha (40 L/ac) when plants are actively growing and follow with tillage in 2-3 weeks. The use of Banvel at these rates after September 1 may result in residue carry-over that will damage the following crop. Plant only cereals, field corn, sweet corn or canola crops the year after treatment.

OR

Apply Roundup, Laredo or Wrangler at 4.7-7.0 L product/ha (1.9-2.8 L/ac) in at least 100 L of water/ha (40 L/ac) (spot treatment) to actively growing plants that are 20-25 cm tall (8-10 in.). Hard frost shortly before or after application will greatly reduce the effectiveness of this treatment.

Note: None of the above listed treatments used alone will give complete control of Canada Thistle and Perennial Sow-Thistle. Control of these perennial weeds requires combined program of treatment in the crop and in the stubble after harvest or on the summerfallow.

The rates given are for the amine formulations of 2,4-D or MCPA (500 g active ingredient/litre
For rates of other formulations of 2,4-D or MCPA. refer to the 2,4-D/MCPA section.

3. Quackgrass

One Season Control: Apply Roundup, Laredo or Wrangler at 2.5 L product/ha (1.0 L/ac) after harvest in the fall in annual cropping systems. Apply in 50-100 litres of clean water/ha (20-40 L/ac) using flat fan nozzles. Spray when most quackgrass is at least 20 cm (8 in.) in height (3 to 4 leaf stage of growth), and actively growing. If quackgrass is sodbound, reduced control will result. If a frost has occurred, wait several days to determine if the quackgrass has recovered. Quackgrass can be treated after a mild frost provided there are 3 to 4 green leaves actively growing at the time of application. Do not apply after the first damaging frost in the fall. Do not till between harvest and fall application. Allow 5 or more days after application before tillage. This treatment can also be applied in the spring. Refer to Zero-Tillage Spring Treatment.

Long Term Control: Apply Roundup, Laredo or Wrangler at 4.7-7.0 L product/ha (1.9-2.8 L/ac). Apply in 50-100 litres of clean water/ha (20-40 L/ac) using flat fan nozzles. Spray when most quackgrass is at least 20 cm (8 in.) in height (3 to 4 leaf stage of growth), and actively growing. If a frost has occurred, wait several days to determine if the quackgrass has recovered. Quackgrass can be treated after a mild frost provided there are 3 or 4 green leaves actively growing at the time of application. Do not apply after the first damaging frost in the fall. Do not till between harvest and fall application. Allow 7 or more days after application before tillage.

B. Soil Incorporated Herbicides

Fall application of incorporated herbicides can result in less drying of the seedbed than spring applications. However, product selection and use should be determined on the basis of local soil and weather conditions. To reduce the risk of soil erosion use the minimum amount of tillage required for satisfactory incorporation of fall applied products. Where possible complete the incorporation procedures in the spring. Conserve trash cover on summerfallow. Granular formulations can be used under trashy conditions. Where the required incorporation will result in excessive trash destruction or soil pulverization do not use the product in the fall.

Advance 10G (granular)
Avadex BW (liquid or granular)
Edge (dispersable concentrate or granular)
Fortress (granular)
Free Flow 10G (granular)
Heritage 5G (granular)
Rival EC (liquid) or Rival 10G (granular)
Treflan EC (liquid) or Treflan QR5 (granular)
Triflurex 40 EC (liquid)

Zero-Tillage Spring Treatment

Weed control before crop emergence is essential to successful crop production in a zero-tillage program. All existing weed and volunteer crop growth should be destroyed shortly before crop emergence.

Wheat, Barley, Oats: Apply Roundup, Laredo or Wrangler at 1.2 L product/ha (0.49 L/ac) tank-mixed with 350 mL/ha (140 mL/ac) of a non-ionic surfactant (e.g. Agral 90, Ag Surf, Triton XR) in 100 L water/ha (40 L/ac) to control wild oats, green foxtail, volunteer cereals and wild mustard. If wild buckwheat, lady's-thumb or lamb's-quarters are present add Pardner at 1.0 L product/ha (0.40 L/ac) to the tank-mix. Note: Do not apply after crop emergence.

Forage Legumes and Grasses: Apply Roundup, Laredo or Wrangler in 100 to 300 litres of clean water/ha (40-120 L/ac) to control emerged vegetation prior to emergence of forage legume and grass seedlings. If legumes and grasses are to be underseeded with a cover crop, it must be applied prior to planting a labelled cover crop. Apply at the recommended label rates and stage of weed growth. Tillage such as fall plowing, spring plowing, discing or mowing prior to application will reduce effectiveness on perennial weeds.

Quackgrass (One Season Control): Apply Roundup, Laredo or Wrangler at 2.5 L product/ha (1.0 L/ac) in spring prior to planting. Apply in 50-100 litres of clean water/ha (20-40 L/ac) using flat fan nozzles. Spray when most quackgrass is at least 20 cm (8 in.) in height (3 to 4 leaf stage of growth), and actively growing. If quackgrass is sodbound, reduced control will result. Quackgrass can be treated after a mild frost provided there are 3 to 4 leaves actively growing at the time of application. Do not till between harvest (the previous fall) and the spring application. Allow at least 5 days after application before tillage.

Chemical Fallow or Minimum Tillage Fallow Treatments

BANVEL

Apply Banvel at 230-290 mL product/ha (90-120 mL/ac) tank-mixed with 2,4-D Amine 500 at 1.1 L product/ha (0.45 L/ac) or 2,4-D LV Ester 600 at 0.92 L product/ha (0.37 L/ac) to control certain broadleaf weeds. Apply in 50-100 L of water/ha (20-40 L/ac) in the spring to emerged and actively growing weeds in the 2-4 leaf stage. Reduced control may occur if applications are made at an advanced stage of weed development. For control of annual grassy weeds including volunteer cereals, Banvel plus 2,4-D may be mixed with Sweep at 1.7-2.25 L product/ha (0.7-0.9 L/ac).

OR

ROUNDUP, LAREDO, WRANGLER (glyphosate)

Apply glyphosate at 0.75-1.0 L product/ha (0.3-0.4 L/ac) mixed with 350 mL/ha (140 mL/ac) of non-ionic surfactant (eg. Agral 90, Ag Surf, Triton XR) in 50-100 L of clean water/ha (20- 40 L/ac) to control wild oats, green foxtail, volunteer cereals and wild mustard. The higher rate of application should be used when weeds are beyond 8 cm (3 in.) in height and/or when heavy weed infestations are present. For control of certain additional broadleaf weeds glyphosate at the recommended rates may be tank-mixed with Banvel at 290 mL/ha** (120 mL/ac) OR 2,4-D amine (500 g active ingredient/litre) at 0.70 L/ha (0.28 L/ac), plus 350 mL/ha (140 mL/ac) of a non-ionic surfactant (eg. Agral 90, Ag Surf, Triton XR). For weeds controlled by any specific tank-mix refer to the label. Reduced results may occur if applications of glyphosate alone or in tank mixtures are made to weeds which are not actively growing, drought stressed or beyond 15 cm (6 in.) in height.

**For control of wild buckwheat apply Banvel (480 g/L) at 600 mL/ha (240 mL/ac).

Glyphosate does not provide residual weed control. Repeat treatments may be necessary. Apply glyphosate with ground equipment only, avoid drift to prevent injuring valuable vegetation. Thoroughly wash equipment after spraying, do not contaminate water sources by disposal of wastes or cleaning of equipment. Do not use glyphosate in galvanized spray equipment.

OR

RUSTLER

Apply Rustler at 2.5 L product/ha (1.0 L/ac) in 50-100 L of clean water/ha (20-40) L/ac) to control: wild oats, green foxtail,Persian darnel, volunteer cereals, wild buckwheat, stinkweed, wild mustard, kochia, Russian thistle, lamb's quarters, cow cockle, volunteer canola and smartweed. For control of flixweed or foxtail barley 3.125 L product/ha (1.25 L/ac) is recommended. Application to grassy weeds can be made from emergence to heading, however, for controlling wild oat apply Rustler during the 1-3 leaf stage.

For control of redroot pigweed in addition to the weeds previously listed, apply 2.5 L/ha (1.0 L/ac) fo Rustler tank-mixed with 1 L/ha(0.4L/ac) of 2,4-D amine 500. For best results, apply before weeds reach 15 cm in height.

Rustler does not provide residual weed control. Repeat treatment may be necessary. Apply Rustler with ground equipment only, avoid drift to prevent injuring desired vegetation. Thoroughly wash equipment after spraying. Do not use Rustler in galvanized spray equipment.

OR

SWEEP

Apply Sweep at 1.7-2.25 L/ha (0.7-0.9 L/ac) in 110-200 L water/ha (45-80 L/ac) when annual grasses are in the 2-4 leaf stage. Apply at 2.25 L/ha (0.9 L/ac) under dry conditions or if weed population is very dense. Use 150-200 L water/ha (60-80 L/ac) when weeds are in the 4-leaf stage. In most seasons 2 applications will be required for annual grass control, once in late May or June and another one in late July and August.

If broad-leaved weeds such as wild buckwheat or other hard to kill broadleaf weeds are present at the time of application or between applications or Sweep, apply one of the following tank mixes, or a separate application of a broad-leaved weed herbicide registered for summerfallow use. Sweep may be tank-mixed with 2,4-D, MCPA, Buctril-M, Banvel plus 2,4-D or Lorox plus MCPA. Before tank mixing, consult labels of these herbicides for recommended rates, soil pH, cropping and rotation restrictions.
Lorox plus MCPA should only be applied once per season.

Tank mixes of Sweep and amine formulations of 2,4-D, MCPA and dicamba should be sprayed immediately and not allowed to stand overnight or the effectiveness of the spray will be reduced.

Use clear water for applying Sweep and apply with ground equipment only. Applications on cloudy days or just before darkness will generally increase the effectiveness of the treatment. Avoid drift onto nearby valuable vegetation. Thoroughly wash equipment after spraying. Use a detergent at 30 mL/60 L of water, circulate and spray out, then rinse with clean water. When possible, fill sprayer with clean water and let stand overnight before draining.

Perennial Weed Control

1. Spot Treatment in Summerfallow

Canada Thistle - Perennial Sow-Thistle

Begin cultivation in early spring and continue into early summer. A final cultivation should be done within the first 2 weeks of July and thistles allowed to grow to the early bud stage (15-25 cm (6-10 in.) tall), then apply;

a) 2,4-D LV Ester 500 or MCPA Ester at 2.2 L product/ha (0.9 L/ac); or

b) Banvel (480 g/L) at 2.5 L product/ha (1.0 L/ac); or

c) Banvel (480 g/L) at 1.25 L/ha (0.51 L/ac) with 2,4-D amine at 2.2 L product/ha (0.90 L/ac); or

d) Banvel (480 g/L) at 1.25 L product/ha (0.51 L/ac) tank-mixed with Laredo, Wrangler or Roundup at 1.7 L product/ha (0.69 L/ac) plus 350 mL/ha (142 mL/ac) of a non-ionic surfactant.

Apply the above in 100 L of water/ha (40 L/ac). Cultivate 3 weeks after treatment. If application of Banvel is made after September 1 or if soil moisture levels are extremely low subsequent to application crop injury may occur. Plant only cereal crops the year after treatment with b) and c); plant only cereal, corn or canola crops after treatment d).

OR

Apply Target at 2.0 L product/ha (0.80 L/ac). Do not cultivate for a minimum of 4 weeks after application.

OR

Apply Amitrol-T at 22.0-35.0 L product/ha (8.9-14.2 L/ac) when the thistles are in the bud-bloom stage. Resume cultivation three weeks after treatment or follow-up with other chemical treatments as required.

OR

a) For control of Canada thistle (rosette stage only) work summerfallow as usual with the last tillage operation during the last week of July. Allow thistles to regrow for a minimum of 4 weeks until they are a minimum of 15 cm (6 in.) in diameter and in the rosette stage of growth. Apply Roundup, Laredo or Wrangler at 2.5 L product/ha (1.0 L/ac) in 50-100 L of clean water/ha (20-40 L/ac). Under dry conditions there may be insufficient regrowth to permit application. Use flat fan nozzles. Allow at least 10 days before resuming cultivation if desired. Do not use in galvanized spray equipment.

OR

b) Work summerfallow or apply chemical fallow treatment as usual in the spring to control early germinating weeds and volunteer grain. Allow thistles to grow to the bud stage. Apply Roundup,

Laredo or Wrangler at 4.7-7.0 L product/ha (1.90-2.80 L/ac) in at least 100 L of water/ha (40 L/ac).

OR

Apply Lontrel at 1.5 L product/ha (0.6 L/ac) when Canada thistle is between the rosette and the early bud stage and actively growing.

Quackgrass

Apply Amitrol-T at 22.0-35.0 L product/ha (8.9-14.2 L/ac) when quackgrass is growing rapidly and growth is 15 to 20 cm (6-8 in.) in height. Use at least 280 L of water/ha (110 L/ac). Plow or disc the treated area about 3 weeks after treatment when the quackgrass has turned white or purple. Spot treat any green re-growth. Repeat applications will be necessary where plowing or cultivation is not practiced.

OR

Work summerfallow or apply chemical fallow treatment as usual in the spring. Allow quackgrass to grow until just prior to heading. Apply Roundup, Laredo or Wrangler at 4.7-7.0 L product/ha (1.90-2.80 L/ac) in at least 100 L of water/ha (40 L/ac). For quackgrass allow at least 7 days after treatment before resuming cultivation. Do not use in galvanized spray equipment.

Field Bindweed

Allow bindweed to grow to the flowering stage and then apply either one of the following treatments:

Apply Banvel (480 g/L) alone at 2.5 L product/ha, or mixed with 2,4-D amine at 2.2 L product/ha (0.90 L/ac) in 100 L of water/ha (40 L/ac). Resume cultivation as required if re-growth occurs. Plant only cereal crops the following year and treat with 2,4-D or Banvel and 2,4-D mixtures as recommended for cereal crops.

OR

Apply Roundup, Laredo or Wrangler at 7.0-12.0 L product/ha (2.8-4.9 L/ac) in 100 L of water/ha (40 L/ac). Plant to cereal crops the following year and treat with 2,4-D or Banvel and 2,4-D mixtures as recommended for cereal crops. Do not use in galvanized spray equipment.

Toadflax

Apply Amitrol-T at 22-35 L product/ha (8.9-14.2 L/ac) when toadflax is in the advanced rosette to prebud stage. Use at least 280 L of water/ha (110 L/ac). Till 3 weeks after treatment, when top growth is bleached.

OR

Apply Roundup, Laredo or Wrangler at 7.0-12.0 L product/ha (2.8-4.9 L/ac) in 100 L of water/ha (40 L/ac) when toadflax is in the early bud stage. Allow 7 or more days before tillage. Do not use in galvanized spray equipment.

OR

Apply 2,4-D Amine 500 at 4.4-9.0 L product/ha (1.7-3.6 L/ac) when toadflax is in the early bud stage. Till when regrowth appears. This treatment only provides suppression.

2. Spot Treatment in Wheat, Oats, Barley, Seed Forages

Roundup, Laredo or Wrangler may be used for spot treatment of quackgrass, Canada thistle, and other perennial weeds in wheat, oats, barley and seed forages. Treatment may be made up to heading of small grains and seed forages. Apply at recommended label rates and stage of weed growth. Applications can be made with a boom sprayer, hose and handgun or hand sprayer. **The Crop in the Treated Area Will Be Killed.** Take care to avoid drift outside the target area.

Volunteer Crop Control

Volunteer crops can be serious weed problems in seed fields and in continuous cropping programs. Since there are very few herbicides registered for controlling volunteer crops, control by herbicide alone is often not adequate. Therefore, control should be based on timely tillage supplemented, where possible, by herbicides. Choice of herbicides is limited and thus consideration must be given to choosing crop rotations which allow for use of an appropriate herbicide. At no time should a herbicide be used for volunteer crop control unless it is registered for use in the crop being grown.

The suggestions for volunteer crop control found in the chart at the centre of this booklet are based largely on field observations. In most cases the herbicides are not registered for this purpose and so any such use is entirely at the risk of the user.

Follow label recommendations regarding rates, stage of application, water volumes etc. that apply to the crop being produced. Most of these treatments will result in suppression rather than complete kill and satisfactory control will depend on competition from a vigorous crop. Use the highest rate that is safe for use in the crop produced.

Herbicide and Liquid Fertilizer Mixes

Some herbicides can be mixed with liquid fertilizers for once over application of both products. This practice should be used only for products which have been registered for this use. Thorough mixing and even application are required. Accurate calibration of application equipment is essential to ensure that the correct rate of herbicide is applied. Test the compatibility of the herbicide in the liquid fertilizer before adding the herbicide to the tank. Ensure that there is sufficient agitation to maintain uniform mixture in the tank at all times. There are compatibility agents available which produce a more uniform mixture. Check the herbicide label for specific names of agents and directions.

The following products can be applied with liquid fertilizer:

AVADEX BW (triallate)
EPTAM (EPTC)
ERADICANE (EPTC + R25788)
ESTEMINE MCPA
RIVAL EC (trifluralin)
RIVAL EC + AVADEX BW
SUTAN (alone or with AATREX)
TREFLAN (trifluralin)
TREFLAN + AVADEX BW
TRIFLUREX EC (trifluralin)
TRIFLUREX EC + AVADEX BW

NOTE: For specific directions regarding a herbicide and liquid fertilizer mix, refer to the product label.

Herbicide and Insecticide Mixes

Some herbicides can be mixed with insecticides for once over application. This practice should be used only for products which have been registered for this use and used on crops listed on both labels. Other mixtures may not be effective, may injure the crop, may leave a harmful residue in the treated crop or may endanger the health of the applicator. In many cases a specified time interval is required between the application of a herbicide and an insecticide.

Application of registered and recommended mixtures must be made at the proper stages for both weed and insect pests. The following herbicide and insecticide tank mixes are registered:

2,4-D (amine or ester) + Furadan Flowable
MCPA (amine or ester) + Furadan Flowable
Hoe-Grass + Decis
Hoe-Grass II + Decis
Stampede 360 + Decis

Note: For specific directions regarding a herbicide and insecticide mix, refer to the product label.

Soil Residual Herbicides

When applied at recommended rates in a crop, most herbicides disappear within a few weeks after application and impose no restriction on cropping options the next year. However, some herbicides do not disappear quickly and can persist in the soil for many months, or years following application, thereby restricting the crops that can be grown in rotation. Herbicides disappear from soils by various means. However, as a rule disappearance processes are favoured by mild and moist conditions. During winter when the ground is frozen, and the summer when the soil is dry, herbicide losses are minimal.

The residual activity of certain herbicides is also affected by soil organic matter and soil pH. These soil factors are seldom uniform across a field. Soil residual herbicide problems that are aggravated by low levels of organic matter are more likely to occur on eroded hilltops than in other parts of a field. Soil pH levels can vary significantly even within a field.

Growers should be aware of the residual properties before applying any herbicide if they are to avoid cropping restrictions in following years. A knowledge of the limitations associated with herbicides which leave a soil residue, along with an accurate record of application (i.e. rates, locations) will serve to minimize rotational problems.

Herbicides that leave a soil residue and are of particular concern in Saskatchewan are as follows:

2,4-D/MCPA - The major mode of disappearance of phenoxy herbicides is through biological degradation. When applied at recommended rates in a crop 2,4-D or MCPA disappear within a few weeks after application and impose no restriction on recropping options the next year. However 2,4-D or MCPA should not be applied in the spring either pre-emergence or prior to the seeding of a broad-leaved crop. Safe recropping intervals for broad-leaved crops cannot be given. The use of high rates of 2,4-D or MCPA in the fall as spot treatments to control Canada thistle can carryover and will affect sensitive broad-leaved crops sown early the following spring.

ADVANCE 10G trifluralin (granular) - See Rival.

ALLY - Rainfall, soil temperature and soil pH are important factors affecting the disappearance of Ally from treated soils. The disappearance is more rapid under conditions of moist soil, warm temperatures and low soil pH. Several crops including forage legumes, field peas and lentils are sensitive to Ally residues in the soil. The use of Ally is limited to soils having a pH of less than 7.9. Refer to the Ally section section or product label for recropping details. Recropping intervals may be reduced if a successful field bioassay* has been completed.

ASSERT 300-LC - The major mode of disappearance of Assert is by microbial degradation. This process is favoured by warm, moist soil conditions. Rotation to various crops the year following application of Assert is dependent upon soil zone. In the black and grey wooded soil zones, wheat (spring, durum), barley, sunflower and canola can be seeded the year following application. In the brown and dark brown soil zones, wheat (spring, durum), barley and sunflower can be seeded the year following application. Wheat (spring, durum), barley, sunflower, flax, peas, canola, oats and canary seed may be seeded in all soil zones 2 years after the application of Assert. To assess potential damage to crops not listed conduct a field bioassay*. Lentils are particularly sensitive to Assert residues in the soil.

The additive effect of soil residues from the use of Ally or Glean herbicides and Assert herbicide on the same land has not been determined. Crop rotation guidelines and minimum rotation intervals are not known and injury to rotational crops other than wheat (excluding durum) may occur. Wherever land will be treated with Ally or Glean herbicides and has been or will be treated with Assert herbicide plant only wheat (excluding durum) after both herbicides have been used until a bioassay* demonstrates that other crops can be successfully grown.

AVADEX BW (liquid and granular) - The major mode of disappearance of Avadex BW from the soil is through volatilization. Under normal conditions, Avadex BW will not leave a harmful residue in the soil to affect following crops. Under dry conditions, however, some Avadex BW may carryover. Therefore, oats should not be sown the year following application.

BANVEL - At recommended rates of application for use in cereal crops Banvel will not leave a harmful residue in the soil. However, high rates of application recommended for perennial weed control in summerfallow and in stubble after harvest may result in residue carryover that will damage the following crop. This is particularly true if application is made after September 1 or if soil moisture levels are extremely low following application. Plant only cereal crops the year after treatment.

EDGE - The major mode of disappearance of Edge from treated soils is by volatilization. This process is favoured by moist conditions. Edge will not harm rotational crops if applied as directed, however, as a precaution very sensitive crops such as canary seed or small seeded grasses should not be grown in rotation to an Edge treated crop.

FORTRESS - The major mode of disappearance of Fortress from the soil is through volatilization. This process is favoured by moist conditions. Under normal conditions, Fortress will not leave a harmful residue in the soil to affect following crops. However, under dry conditions some Fortress may carryover. Therefore, oats, small seeded forage grasses and canary seed should not be grown in rotation following a Fortress treated crop.

FREE FLOW 10G trifluralin (granular) - See Rival.

GLEAN - Soil moisture is important for the disappearance of Glean from treated soils, the greater the soil moisture the faster the disappearance. Soil pH also determines the rate of Glean disappearance from the soil. Several crops including canola, mustard, field peas, flax and lentils are extremely sensitive to Glean residues in the soil. As a result, the use of Glean is limited to continuous wheat or barley production, and to soils having a pH of less than 7.5. Residual effects may last 3 to 5 years depending upon rate applied and weather conditions. Refer to the Glean section or product label for further details. Recropping intervals may be reduced if a successful field bioassay* has been completed.

LONTREL - Fields previously treated with Lontrel herbicide can be seeded to wheat, oats, barley, rye, flax, canola or summer fallowed. Do not seed to crops other than those listed the year after treatment. There are no cropping restrictions thereafter. For updated information concerning the seeding of specialty crops call 1-800-661-6436.

RIVAL trifluralin (liquid and granular) - The major mode of disappearance of trifluralin products from treated soils is by volatilization. This process is favoured by moist conditions. Dry conditions in the year during which a trifluralin treated crop is grown may result in residue levels that will carryover into the next season and injure wheat crops. To reduce the risk of wheat injury avoid deep seeding into cold ground. Barley is more tolerant to trifluralin residues than wheat. Do not plant oats, canary seed or small seeded grasses for 24 months after a spring application or 30 months after a fall application of trifluralin. Do not plant fall rye for 6 months following a spring application or 12 months after a fall application.

TORDON 202-C - The disappearance of Tordon 202-C from soils occurs slowly and varies according to location, climatic conditions and rate of application. Adequate moisture, warm temperatures and high organic matter content favour the degradation of Tordon 202-C, in addition, leaching also plays a role in the disappearance of Tordon 202-C residues.

Several broadleaf crops are very sensitive to Tordon 202-C residues in the soil. It is recommended that fields previously treated with Tordon 202-C herbicide should not be planted to alfalfa and sunflowers until at least the third growing season after the year of treatment; beans, lentils, peas and potatoes until at least the fifth growing season after the year of treatment. For updated information concerning the seeding of specialty crops call 1-800-661-6436.

TREFLAN trifluralin (liquid or granular) - See Rival.

TRIFLUREX trifluralin (liquid) - See Rival.

***Note:** A field bioassay means growing to maturity a test strip of the crop(s) intended for production the following year.

Aircraft Application

Applicators must exercise great care when applying herbicides if they wish (i) to get even distribution of the material, (ii) to avoid damage to nearby crops, and (iii) to avoid injury to the crop being treated. The following suggestions are offered to help minimize these hazards:

1. In order to get the best coverage of plants in the treated swath and to minimize the loss of spray material to the atmosphere.
   (1) Do not spray in winds over 15 km/h (9.3 mph) or less if specified on product label.
   (2) Operate sprayer at 200 kPa (30 psi) except as specified.
   (3) For best results apply herbicides in volumes not less than 35 L/ha (15 L/ac).
   (4) Fly as low as feasible and safe.
   (5) Width of swath should not be more than 1.25 of wingspan (i.e. in most cases not more than 13.1 m (43 ft.)).
   (6) Space the nozzles on the boom to give uniform distribution in the swath in spite of swirl from propeller and vortexes at the wingtips.
2. To Avoid Drift Damage from Aircraft Application.
   (1) Do not spray when wind is blowing toward a sensitive crop, shelterbelt or garden. Safe distances cannot be given.
   (2) Do not spray in dead calm near sensitive plants. The "cloud" of suspended droplets may drift onto sensitive plants when the wind comes up.
   (3) Amines are less volatile than "low volatil" esters and should be used in preference to the low volatile esters.
3. To Avoid Injury to Crops.
   (1) Use water as a carrier in preference to oil. Injury is more likely to occur with oil than with water.
   (2) In order to minimize delay in maturity of flax, volumes of 50 L or more/ha (20 L/ac) should be used.
   (3) Apply at "safe" stage of growth of the crop.
   (4) Select the best chemical for the crop and weeds that are present and use only enough material for the degree of control desired.

Aircraft Application Chart

The following products are registered to be applied by aircraft to the crops indicated. Refer to the section on each product for rates of safe application.

	Barley	Oats	Rye	Wheat	Flax	Canola	Must.	Sflrs.	Peas	Lentil
2,4-D amine	X		X	X						
MCPA amine	X	X	X	X	X					
Avadex BW Granular	X			X	X	X	X			
Avenge	X			X						
Reglone (Crop Desiccation)					X	X	X	X	X	X
Dyvel	X	X		X						
Hoe-Grass	X			X	X	X				
Mataven L				X				X		
Poast					X	X			X	X
Buctril-M	X	X		X						
Banvel	X	X	X	X						
Banvel + 2,4-D amine	X		X	X						
Banvel + MCPA amine or K	X	X		X						
SEE 2,4-DB	X	X		X						
SEE Diphenoprop	X			X						
Fortress	X			X	X	X	X			

1. Glenlea, Neepawa, Chester, Macoun, Selkirk, Canuk, Benito, Columbus, Conway, Oslo, Kenyon, Lancer, Leader, Katepwa, HY320, HY355
2. Do not use on Selkirk wheat.
3. Spring rye only.

Special Weed Problems

The following weeds have been identified as being difficult to control with limited chemical control information available. The herbicide treatments recommended may not be registered for control of the weeds listed. However, limited research data and field experience has shown that the following recommendations will usually give adequate control of the weeds listed. Registered treatments are marked with an asterisk (*).

Many of the recommendations are for spot treatment only on non-cropland. For those recommendations that may be used on field crops the herbicide must be applied only to those crops for which it is registered. **CAUTION:** Always follow registered use patterns in regard to application, timing and use precautions. Refer to product labels or product descriptions for application details. The use of any of the following recommendations on a non-registered crop or target area is entirely at the risk of the user.

Absinth

Banvel Herbicide: Apply at 2.5 L product/ha (1.0 L/ac) alone or at 1.25 L product/ha (0.51 L/ac) tank-mixed with 2,4-D amine at 2.2 L product/ha (0.90 L/ac) when plants are 10-20 cm (4-8 in.) tall (summerfallow, stubble, pastures, rangeland and non-cropland).

Roundup*, Laredo*, Wrangler*: Apply 7.0-12.0 L product/ha (2.8-4.9 L/ac) at the early bud stage of growth. Allow seven days before resuming tillage (summerfallow, stubble and non-cropland).

2,4-D LV ester (600 g/L formulation): Apply 2.8 L product/ha (1.13 L/ac) in the spring and the fall when the weed is growing (summerfallow, stubble, pastures, rangeland and non-cropland).

Baby's-Breath

Banvel Herbicide: Apply 5.0 L product/ha (2.0 L/acre) when actively growing (pastures, rangeland and non-cropland).

Black Medick

Apply the following products at recommended rates for suppression:
Target, Estaprop, Buctril-M, Mecoturf, Mecoprop 300 and 2,4-D[1] at 1.1 L product/ha (0.45 L/ac) when black medick is in the 1-4 leaf stage (use on registered crops only).

Curled Dock

Banvel Herbicide*: Apply 2.1-2.5 L product/ha (0.85-1.0 L/ac) in 100-200 L of water/ha (40-80 L/ac) when dock is actively growing (summerfallow, stubble, pastures, rangeland and non-cropland). Use the high rate on summerfallow and stubble.

Roundup*, Laredo*, Wrangler*: Apply 7.0-12.0 L product/ha (2.8-4.86 L/ac) in 100 L of water/ha (40 L/ac) at the early bud stage of growth. Allow seven days before resuming tillage (summerfallow, stubble and non-cropland).

For treatments that will provide topgrowth control in a crop refer to Herbicide Recommendation Chart.

Dogbane

2,4-D LV Ester or Amine 500: Apply 3.4-4.5 L product/ha (1.4-1.8 L/ac) in the fall before frost and while plant leaves are green (pastures, rangeland and non-cropland).

Roundup*, Laredo*, Wrangler*: Apply 7-12 L product/ha (2.8-4.9 L/ac) when dogbane is in the early bud stage. Apply in 100 L water/ha (40 L/ac). Do not cultivate or mow treated plants for at least 7 days after application (summerfallow, stubble and non-cropland).

Downy Brome

Roundup, Laredo, Wranger: Apply at 1.0 L product/ha (0.4 L/ac) with 350 mL/ha (140 mL/ac) of non-ionic surfactant in 50-100 L of clean water/ha (20-40 L/ac) before downy brome is 15 cm (6 in.) tall (summerfallow and stubble).

Sweep: Fall apply at 2.25 L product/ha (0.9 L/ac) in 110-200 L of clean water/ha (45-80 L/ac) to downy brome in the seedling stage (summerfallow and stubble).

Foxtail Barley

Roundup, Laredo, Wrangler: Application at 5.9 L product/ha (2.4 L/ac) in 300 L/ha of water (120 L/ac) as a post-emergence application in summer will provide a degree of control. Adequate spray coverage on vegetative parts of plants is important for control (summerfallow, stubble and non-cropland).

Kerb 50W*: Apply at 0.9 kg product/ha (0.36 kg/ac) on brown, dark brown or grey-wooded soils or 1.1 kg product/ha (0.45 kg/ac) on thin black or black soils to control established foxtail barley. Fall surface apply in 220 L of water/ha (90 L/ac). Apply only to established pasture stands seeded at least 2 years prior to application. Established stands of orchardgrass, Russian wild ryegrass, Altai wild ryegrass, bromegrass and meadow bromegrass will tolerate 1.1 kg product/ha. The yields of established stands of intermediate wheatgrass, tall wheatgrass, crested wheatgrass, Kentucky bluegrass and meadow fescue could be reduced 5 to 20% in the spring following a fall Kerb application of 1.1 kg product/ha. Kerb should not be applied on timothy.

Note: Tillage will provide the most effective control.

Knawel

Apply Buctril-M, Hoe-Grass II* or Pardner at recommended rates to registered crops only.

Leafy Spurge

2,4-D LV Ester or Amine 500: Apply 2.2 L product/ha (0.9 L/ac) at early flowering stage. Repeat if regrowth appears later in the season (summerfallow and non-cropland).

Amitrol-T* - Apply 45-55 L product/ha (18-22 L/ac) in a minimum 500 L water/ha (200 L/ac) in the flowering to seed set stage (non-cropland). Do not mow treated plants, or cultivate for at least 2-3 weeks after treatment. Retreat as necessary.

Narrow-Leaved Hawk's-Beard

2,4-DB: Apply Embutox 625 at 2.25 L product/ha (0.9 L/ac), or Cobutox or 2,4D Butyric 400 at 3.5 L product/ha (1.4 L/ac) in 150-200 L of water/ha (60-80 L/ac) after alfalfa has stopped growing in the fall.

2,4-D LV Ester 500[1]: Apply 1.1-2.2 L product/ha (0.45-0.90 L/ac) to rosette in fall (summerfallow and stubble).

Pineappleweed

Apply 2,4-D[1] or MCPA[1] at 1.7 L product/ha (0.69 L/ac) to registered crops only. This rate may cause some crop injury.

Plantain

2,4-D/MCPA: For top growth control apply 2,4-D[1] at 0.84-1.1 L product/ha (0.34-0.45 L/ac) or MCPA[1] at 0.70-1.10 L product/ha (0.28-0.45 L/ac) to registered crops only.

2,4-DB*: For top growth control apply Embutox 625 at 2.25-2.75 L product/ha (0.9-1.1 L/ac) or, 2,4D Butyric or Cobutox at 3.5-4.25 L product/ha (1.4-1.7 L/ac) to registered crops only.

Tropotox Plus* For top growth control apply 4.25 L product/ha (1.70 L/ac) to registered crops only.

Poverty Weed

Banvel Herbicide*: Apply 4.6 L product/ha (1.86 L/ac) to actively growing plants (pastures, rangeland and non-cropland).

2,4-DB: Apply Embutox 625 at 2.25 L product/ha (0.9 L/ac) or Cobutox or 2,4D Butyric 400 at 3.5 L product/ha (1.40 L/ac). Apply on barley, oats and wheat, when the shoots of the weeds are 2.5 to 7.5 cm (1-3 in.) high. This may cause some crop injury, particularly to oats. In a two year rotation of cereal and summerfallow, apply to the weeds in the crop. Commence tillage immediately after harvest and continue wherever regrowth occurs throughout the summerfallow year. Repeat the rotation.

2,4-D LV Ester 500: Apply 4.4 L product/ha (1.8 L/ac) to gradually reduce the stand of poverty weed. Spot treatments for at least five years may be required to reduce the stand to a point of eradication (pastures, rangeland and non-cropland).

Quack Grass

For control recommendations refer to Fall Weed Control, Zero-Tillage Spring Treatment and Perennial Weed Control Sections. For top growth control in crop refer to Herbicide Recommendation Chart.

Round-Leaved Mallow

Estaprop or Diphenoprop 600*: Apply 1.75 L product/ha (0.7 L/ac) at the 2-4 leaf stage of the weed.

2,4-D LV Ester 500: Apply 1.7 L product/ha (0.69 L/ac) in 100 L/ha water (40 L/ac) at the 2-4 leaf stage.

Buctril-M: Apply 1.0 L product/ha (0.40 L/ac).

The above treatments should be applied to registered crops only in no less than 100 L of water/ha (40 L/ac) and at the 2-4 leaf stage of the round-leaved mallow.

Note: Round-leaved mallow is a difficult weed to control because of its ability to germinate throughout the growing season, if the conditions are suitable. While Estaprop, 2,4-D and Buctril-M will control round-leaved mallow seedlings, which are present at the time of spraying, there is no residual activity on later germinating weeds. It is therefore important to have a competitive crop which will greatly assist in suppressing any late germinating round-leaved mallow plants.

Stork's-Bill

Estaprop or Diphenoprop 600*: Apply 1.75 L product/ha (0.7 L/ac) when weeds are at the 2-4 leaf stage to registered crops only.

Glean*: Apply 15 g product/ha to registered crops only.

2,4-D[1]/MCPA[1]: Apply at 1.4-1.7 L product/ha (0.56-0.69 L/ac) to the seedling stage in 100-165 L of water/ha (40-65 L/ac) to registered crops only. These high rates may cause some crop injury.

Afolan*/Lorox: Apply Afolan F or Lorox L at recommended rates tank-mixed with MCPA amine at 1.1 L product/ha (0.45 L/ac) at the 1-4 leaf stage to registered crops only.

Tansy

Roundup, Laredo, Wrangler: Apply at 4.7-7.0 L product/ha (1.9-2.8 L/ac) in 100 L of water/ha (40 L/ac) to actively growing plants that are 20-25 cm (8-10-in.) tall (summerfallow, stubble and non-cropland).

Vetch (Vicia spp.)

2,4-D[1]/MCPA[1]: Apply at 1.1-1.7 L product/ha (0.45-0.69 L/ac) to registered crops only. The high rate of application may cause some crop injury.

Banvel Herbicide: Apply at 220-290 mL product/ha (90-120 mL/ac) with 2,4-D amine or MCPA amine at 850 mL product/ha (340 mL/ac) to registered crops only.

Volunteer Alfalfa

2,4-D[1]: Apply 1.25-1.70 L product/ha (0.51-0.69 L/ac) for top growth control to registered crops only. The high rate of application may cause some crop injury. Lontrel and Glean (at 30 g product/ha) will provide control when applied to registered crops.

Water Smartweed

Banvel Herbicide: Apply 2.5 L product/ha (1.0 L/ac) in 150 L/ha water (60 L/ac) in mid-summer when the weeds are actively growing. At the time of application, shoots should be at least 30 cm (12 in.) tall but prior to flowering.

Roundup, Laredo, Wrangler: Apply 5.0 L product/ha (2.0 L/ac) in 150 L of water/ha (60 L/ac) in mid-summer when the shoots are 20-30 cm (8-12 in.) in length and are actively growing. Do not cultivate for 14 days after treatment. Roundup at 1.7 L/ha (0.7 L/ac) may be tank-mixed with Banvel at 1.25 L/ha (0.5 L/ac) for similar results.

Note: Eradication with herbicides is impractical. The above treatments have been observed to provide suppression. Use only on summerfallow and non-cropland.

White Cockle

Mecoturf: Apply 5.5 L product/ha (2.2 L/ac) in 200 L/ha water (80 L/ac) for top growth control of established plants. Will also control seedlings. Apply to registered crops only.

Banvel Herbicide: Apply 290 mL product/ha (120 mL/ac) tank-mixed with 0.85 L product/ha (0.34 L/ac) of 2,4-D or MCPA amine, or 1.1 L product/ha (0.45 L/ac) of MCPA potassium salt to control seedlings in the 2-4 leaf stage. Apply to registered crops only.

2,4-DB: Apply Embutox 625 at 2.75 L product/ha (1.1 L/ac) or, 2,4D Butyric 400 or Cobutox at 4.25 L/ha (1.7 L/ac) for top growth control to registered crops only.

Wild Rose:

Refer to Herbicides for Rangeland and Native Pastures.

Wild Tomato:

2,4-D /MCPA : Apply at 0.84-1.1 L product/ha (0.34-0.45 L/ac) up to the 8-leaf stage. Formulated or tank mixtures of the above phenoxy herbicides with dicamba or bromoxynil will give similarly good control. Apply to registered crops only.

These rates are for the amine formulations of 2,4-D and MCPA (500 g active ingredient/litre). For rates of other formulations of 2,4-D and MCPA see conversion factors in the 2,4-D/MCPA section.

Cleaning the Sprayer

The sprayer should be cleaned at the end of *each day of use or before switching to other* herbicides by flushing the tank, pump, hoses thoroughly with clean water. Clean the filters, screens and nozzles. Drain the tank and allow it to dry. Before spraying any crop that is sensitive to the herbicide previously used in the sprayer, it is recommended to repeat the above procedure at least once. Some products have specific cleaning recommendations (e.g. Glean). Refer to product labels for additional instructions. To clean the sprayer for winter storage the following procedures should be followed. To remove emulsion formulations (e.g. 2,4-D ester) proceed as follows:

a. Run clean water through the pump, tank, etc.
b. Remove and clean nozzles and screens.
c. Spray out through pump lines and drain thoroughly.
d. Half fill the spray tank with water.
e. Add household detergent (1 kg/250 L of water) and circulate for 5 to 10 minutes.
f. Wash down the inside of the tank with a mop or scrub brush. Do not enter the tank.
g. Spray out through pump lines and drain thoroughly.
h. Proceed to step d. below.

To remove water soluble (e.g. MCPA amine) formulations proceed as follows: a. After draining sprayer thoroughly, fill with clean water and circulate through pump, lines, etc.
b. Drain the sprayer.
c. Remove nozzles and screens and wash separately.
d. Fill with clean water containing 1 L of household ammonia per 100 L of water.
e. Circulate this solution through entire sprayer system.
f. Wash down the inside of the tank with a mop or scrub brush. Do not enter the tank.
g. Allow to stand overnight.
h. Re-circulate cleaning solution for 5 to 10 minutes.
i. Drain entire sprayer system.
j. Rinse with clean water.

Never clean a sprayer near susceptible plants or where wash water could contaminate farm ponds, streams, or other supplies of water.

Note: Commercial cleaners such as Agri-Kleen and the Surfactant Agral 90 are available at most agricultural retail outlets.

Effect of Rainfall on Herbicide Efficacy

*Interval Required	Product
30 minutes	Buctril-M, Pardner, Reglone
1 hour	Embutox 625, Excel, Hoe-Grass, Hoe Grass II, Stampede 360, Stampede CM, TCA, 2,4-D Butryic 400, Poast, Afolan F, Lorox L, Cobutox, SEE 2,4-DB.
2 hours	Mataven L, MCPA Ester, 2,4-D LV Ester, Bladex Liquid, Fusilade, Fusilade II, SEE 2,4-D or MCPA.
3 hours	Target, MCPA Estemine, 2,4-D Estemine, Assert, Laser, Excel, Triumph Plus
4 hours	Banvel, Blagal, Tropotox Plus, 2,4-D Amine, Dyvel, MCPA Amine
6 hours	Avenge, Basagran, Lexone DF, MCPA K, MCPA Sodium Salt, Roundup, Sencor 75DF, Sencor 500, Tordon 202C, Lontrel, Rustler, Refine, Laredo, Wrangler, Muster
8 hours	Amitrol-T

*Time generally required between application and rainfall to avoid significant reduction in efficacy. Rainfall shortly after application of a post-emergence herbicide may reduce weed control. Effect will vary with the product, the interval between spraying and rainfall, and the amount and duration of rainfall. These guidelines are based on label information. Use the longest time interval when considering tank mixes.

Grazing and Feeding Restrictions

Product	**Restriction**
Advance 10G	None.
Afolan F	Do not graze or feed green plants to livestock.
Ally	None.
Amitrol T	Do not graze until six months following treatment.
Assert 300-LC/300-SC	Do not graze treated fields or cut for feed.
Avadex BW	No grazing restrictions except for underseeded legumes. Do not harvest legumes for forage in the year of seeding.
Avenge 200-C, 280-C	Do not graze or feed underseeded forage crops during the year of 640 SP establishment, or other crops for 8 weeks after treatment.
Banvel Herbicide	If used in a tank-mix with MCPA, MCPA-K or metribuzin, do not graze or harvest **cereal** crops for livestock feed prior to crop maturity. In cases where the cereal crop treated with Banvel alone or in a tank-mix with 2,4-D is to be used as feed or pasture, if treated vegetation has been consumed by meat animals within 30 days of application, feed the animal with untreated diet for 30 days before slaughter. Meat animals may graze or feed on treated vegetation 30 after application without restrictions on slaughter. For specific restrictions regarding dairy cattle refer to product label.
Basagran	None.
Blagal	Do not graze or feed the immature crop from the treated area to livestock.
Buctril M	Do not graze or harvest for livestock feed within 8 weeks of application.
Diphenoprop 600/ SEE Diphenoprop	There is no information available on grazing restrictions.
Dyvel	Do not graze or harvest for livestock feed prior to crop maturity.
Edge DF, Granular	None.
Embutox 625, 2,4D Butyric 400, Cobutox, SEE 2,4-DB	None.
Eptam 8E	None.
Estaprop	There is no information available on grazing restrictions.
Excel	Do not graze treated fields prior to harvest.
Fortress	None.
Free Flow 10G	None.
Fusilade/Fusilade II	Do not graze or harvest crops for forage in the year of treatment.
Glean	None.
Heritage	None.
Hoe-Grass	Do not graze prior to harvest. Forages - do not graze or harvest in treatment year.
Hoe-Grass II	Do not graze treated crop prior to harvest.

Kerb 50W	Do not harvest or graze within 90 days after application of 3.25 kg/ha or 60 days after rates less than 3.25 kg/ha.
Laser	Do not graze treated crop prior to harvest.
Lexone DF	Do not graze or feed treated cereal crops to livestock within 30 days of application. Do not harvest for grain within 60 days of application. For peas, do not harvest or feed within 70 days of application.
Lontrel	Do not graze or harvest for feed within 60 days of application.
Lorox L	Do not graze or feed green plants to livestock.
MCPA	Do not graze dairy cattle within 7 days of spraying.
Mataven L	Do not graze treated areas. Forages - do not graze or harvest for feed in treatment year.
Mecoprop 300	Do not feed treated crop to livestock.
Mecoturf	Do not feed treated crop to livestock.
Muster	Do not graze or feed to livestock within 60 days of application.
Pardner	Do not graze or harvest for livestock feed within 8 weeks of application.
Poast	Do not graze treated fields or harvest for feed prior to crop maturity.
Princep Nine-T	Do not graze for 30 days or harvest for feed for 60 days after application.
Refine	Do not graze or harvest for livestock feed within 7 days of application.
Reglone	No waiting period after use before straw may be fed to livestock.
Rival	None.
Roundup, Laredo, Wrangler	Do not graze or harvest treated areas until treated plants have turned brown and started to deteriorate.
SEE 2,4-D	Do not graze for 7 days after treatment.
Sencor 75DF, Sencor 500	Do not graze or feed treated crops to livestock within 30 days of application. Do not harvest for grain within 60 days of application. Do not feed, graze, or harvest peas or lentils within 70 days of application.
Simazine 80W	Do not graze for 30 days or harvest for feed for 60 days after application.
Stampede 360, Stampede CM	None
TCA, NaTA, Barfox DS	Do not graze treated areas for at least 24 hours after treatment.
Target	Do not graze or harvest for livestock feed within 7 days of application.
Tordon 202-C	Do not allow animals to graze treated field within 2 weeks of treatment. Refer to label for precautions on use of manure when treated crop is fed.
Treflan	None.
Triflurex	None.
Triumph Plus	Do not graze treated fields prior to harvest.
Tropotox Plus	None.
Velpar	Do not graze or harvest the treated crop for feed.
2,4-D	Do not graze for 24 hours after treatment.

This is a summary of label restrictions for herbicides recommended for cereal and forage crops. Consult product labels for specific information and for other crops.

Winter Storage of Herbicides

Herbicides which are being carried over winter must be stored under correct conditions in order to avoid problems and losses the following year. Freezing causes some liquids to expand. This may result in broken containers and subsequent loss and contamination due to leaks. In addition, freezing may cause an irreversible separation or deactivation of ingredients which will render the product unusable or useless. All herbicides should be stored at temperatures above freezing.

However, some herbicides which separate on freezing can be brought back into suspension and thus made usable again by warming to room temperature (20-22 C) and agitating thoroughly on several successive days before use.

The following is a classification of the most commonly used herbicides according to their storage temperature requirements.

1. Herbicides which must be kept in heated storage. DO NOT FREEZE.

Afolan F
Amiben
Amines of 2,4-D, MCPA
AAtrex L
Alanap
Amitrol T
Asulox F
Avadex BW
Bladex Liquid
Compitox
Cutrine
Dy-amine
Edge DC
Estemines (2,4-D, MCPA)
Excel
Gramaxone
Hoe-Grass
Hoe-Grass II
Hyvar XL
Killex
Laser
Lexone L
Lontrel
Lorox L
Mataven L
MCPA K
MCPA Na
Mecoprop 300
Mecoturf
Mecoturf + 2,4-D
Premerge 360
Primatol Liquid
Randox
Reglone
Reglone A
Sencor Solupak
Sweep
Target
TCA (liquid)
Tordon 22K
Tordon 101
Tordon 202-C
Triumph Plus
Tropotox
Tropotox Plus
Velpar L

2. Herbicides which may be stored at freezing temperatures, but which must be returned to their original state by warming to room temperature (20-22 C), and agitating thoroughly on several successive days before use.

Assert LC-300/SC-300
Avenge 200-C, 280-C
Banvel Herbicide
Basagran
Blagal
Buctril-M
Butryic 400
Carbyne 2EC
Cobutox
Diphenoprop 600
Dycleer
Dycleer 24
Dyvel
Dytop
Embutox 625
Eptam 8-E
Eradicane
Estaprop
Esters of 2,4-D, MCPA
Fusilade
Laredo
Lasso
Pardner
Poast
Rival EC
Roundup
Rustler
SEE 2,4-D
SEE MCPA
SEE 2,4-DB
SEE DIPHENOPROP
Sencor 500
Silvaprop
Stampede 360
Stampede CM
Sutan+
Tillam
Treflan EC
Triflurex 40 EC
Wrangler

3. Herbicides normally sold as granules or powders: Not usually damaged by freezing. Store in dry place.

Advance 10G
Ally
Amazine
Avadex BW 10G
Avenge 640 SP
Bar-Fox
Bluestone
Calmix pellets
Edge Granular
Fortress
Free Flow 10G
Glean
Heritage
Hyvar X
Karmex
Kerb 50W
Krovar
Lexone
Lorox WP
Muster
Princep Nine-T
Refine
Rival 10G
Sencor DF
Simazine 80W
Sinbar
TCA NaTA
Tordon 10K
Treflan
Ureabor

Chemical Products and Availability

Product	Common Name	Activity	Manufacturer	Container Size	Available From (See List)
Advance	trifluralin	10%G	DowElanco	22.7 kg	1,3,6,8,10
Afolan F	linuron	450 g/L F	Hoechst	10 L	5,6,8,10
Ally	metsulfuron methyl	60% DF	Dupont	122 g	1,6,8,10
Amiben	chloramben	240 g/L SN	Rhone Poulenc	20 L	10
Amitrol-T	amitrole	200 g/L SN	Rhone Poulenc	1, 10 L	1,3,4,6,8,9
Assert LC-300/SC-300	imazamethabenz	300 g/L SN	Cyanamid	10.8L	1,3,4,5,6,8,9
Atrazine 500	atrazine	500 g/L F	United Agri	10 L	5,10
Atrazine 90W	atrazine	90% WP	United Agri	4 kg	5,10
Attra Mix	atrazine + oil	400 g/L + oilF	ICI Chipman	20 L	1,2,3,6,8,9,10
Avadex BW	triallate	400 g/L EC, 10% G	Monsanto	22.7 L, 22.7 kg	1,3,5,6,8,9
Avenge 200-C	difenzoquat	200 g/L SN	Cyanamid	20 L	1,3,4,6,8,9
Avenge 280-C	difenzoquat	280 g/L SN	Cyanamid	10 L	1,3,4,6,8,9
Avenge 640-SP	difenzoquat	64%WSP	Cyanamid	8.85 kg	1,3,4,6,8,9
Banvel Herbicide	dicamba	480 g/L SN	Sandoz	5 L	1,3,4,5,10
				9.5 L	1,3,4,5,6,8,9,10
Bar-Fox DS	TCA	83%p WSP	Ciba-Geigy	2 x 10 kg	10
Basagran	bentazon	480 g/L SN	BASF	2 x 7 L	3,8,9,10
Bladex	cyanazine	480 g/L F	Ciba-Geigy	2x10 L	3,6,8,9,10
Blagal	cyanazine + MCPA K (1:2)	375 g/L F	DuPont	2x10 L	3,6,8,9,10
Buctril M	bromoxynil + MCPA E	560 g/L EC	Rhone Poulenc	2x8 L	1,3,4,6,8,9,10
Cerone	ethephon	480 g/L SN	Rhone Poulenc	5 L	10
Cobutox	2,4-DB	400 g/L EC	IPCO	4 L	3
Cytrol	amitrole	240 g/L SN	Cyanamid	20 L	2
Dalapon	dalapon	74% WSP	IPCO	25 kg	3
Diphenoprop 600	dichlorprop + 2,4-DE	600 g/L EC	United Agri	10 L	5,10
Dynap	naptalam +	3.6 lbs./gal. SN	Uniroyal	1.5 gal.	manufacturer
Dyvel	dicamba + MCPAK	420 g/L SN	Sandoz	10 L	1,3,4,5,6,8,9,10
Edge	ethalfluralin	60% WDG, 5% G	DowElanco	750 g, 22.7 kg	1,3,6,8,10
Embutox 625	2,4-DB	625 g/L EC	Rhone Poulenc	2 x 10 L	1,4,6,8,9,10
Eptam-8E	EPTC	798 g/L EC	ICI Chipman	2 x 10 L	1,2,3,6,8,9,10
Eradicane	EPTC + R25788	798 g/L EC	ICI Chipman	2 x 10 L	1,2,3,6,8,9,10
Estaprop	Dichlorprop + 2,4-D E	600 g/L EC	Rhone Poulenc	2x8 L	1,3,4,6,8,9,10
Estemine MCPA	MCPA amine	500 g/L SN	Ciba Geigy	2x10 L	3,6,8,10
Estemine 2,4-D	2,4-D amine	470 g/L SN	Ciba-Geigy	2x10 L	3,6,8,10
Excel	fenoxaprop-ethyl	90 g/L EC	Hoechst	10 L	1,3,6,8,9,10
Fortress	triallate + trifluralin	14% G	Monsanto	22.7 kg	1,8
FreeFlow	trifluralin	10% G	United Agri	22.7 kg	5,10
Fusilade	fluazifop-butyl	250 g/L EC	ICI Chipman	2 x 8 L	1,2,3,6,8,9,10
Fusilade II	fluazifop-butyl	125 g/L EC	ICI Chipman	2 x 8 L	1,2,3,6,8,9,10
Glean	chlorsulfuron	75% DF	Dupont	500 g	1,3,6,8,9,10
Gramoxone	paraquat	200 g/L SN	ICI Chipman	1.5 L	1,2,3,6,8,9,10
Heritage	trifluralin	5% G	DowElanco	25 kg	1,3,6,8,10
Hoe-Grass	diclofop methyl	284 g/L EC	Hoechst	20 L	3,6,8,9
Hoe-Grass II	diclofop methyl + bromoxynil	310 g/L EC	Hoechst	20 L	3,6,8,9
Kerb 50W	propyzamide	50% WP	Rohm & Haas	2 kg	2,3,4,8
Laredo	glyphosate	356 g/L SN	United Agri	10 L	5,10
Laser	fenoxyaprop/bromoxynil/ MCPA	252 g/L EC	Hoechst	20 L	3,5,8,9,10
Lexone DF	metribuzin	75% DF	Dupont	2.5 kg	1,2,3,7,8
Lontrel	clopyralid	200 g/L EC	DowElanco	2x4 L	1,3,4,5,6 8,9,10
Lorox L	linuron	480 g/L F	Dupont	10 L	1,2,4,7,8,9
Mataven L	flamprop-methyl	52.5 g/L EC	DuPont	2x10 L	3,6,8,9,10
MCPA	MCPA	300,400,500 g/L	various	various	various
Mecoprop 300	mecoprop	150 g/L SN	United Agri	10 L	5,10
Mecoturf	mecoprop	150 g/L SN	Rhone Poulenc	2x8 L	1,4,6,10
Monoborchlorate	sodium metaborate	97.8% G tetrahydrate + sodium chlorate	Occidental Chemicals Co.	50 lb.	7,10
Muster	DPX 7881	75% DF	DuPont	320 g	1,6,8,10
NaTA	TCA	85% WSP	Hoechst	25 kg	3,5,6,8,9
Pardner	bromoxynil	280 g/L EC	Rhone Poulenc	2x8 L	1,3,4,6,8,9,10
Poast	sethoxydim	184 g/L EC	BASF	2 x 7 L	3,8,9,10
Princep Nine T	simazine	90% WDG	Ciba-Geigy	12 x 1.5 kg	8,10
Refine	thifensulfuron	75% DF	DuPont	320 g	1,6,8,10
Reglone	diquat	200 g/L SN	ICI Chipman	10 L	1,2,3,6,8,9,10
Rival	trifluralin	500 g/L EC,10%p G	Hoechst	9 L, 22.7 kg	9,10
Roundup	glyphosate	356 g/L SN	Monsanto	1,4,10 L	1,3,5,6,8,9
Rustler	glyphosate + dicamba	192 g/L SN	Monsanto	10 L	1,8
SEE 2,4-D	2,4-D ester	450 g/L SN	United Agri	10 L	5,10
SEE MCPA	MCPA E	444 g/L EC	United Agri	10 L	5,10

Extension Agrologists

District #	Location	Phone
1	Estevan	634-0701
2	Assiniboia	642-3555
3	Assiniboia	642-3555
4	Shaunavon	297-2624
5	Moosomin	435-3357
6	Indian Head	695-2263
7	Weyburn	848-2384
8	Moose Jaw	694-3610
9	Swift Current	778-8284
10	Maple Creek	662-3625
11	Leader	628-3661
12	Yorkton	786-1528
13	Melville	728-2100
14	Regina	787-2344
15	Davidson	567-2806
16	Outlook	867-8684
17	Kindersley	463-2599
18	Kamsack	542-2523
19	Canora	563-5604
20	Wynyard	554-2526
21	Watson	287-3794
22	Saskatoon	933-8320
22	Saskatoon	933-5326
23	Biggar	948-2666
24	Kerrobert	834-2323
25	Hudson Bay	865-2272
26	Tisdale	873-2693
27	Melfort	752-6155
28	Wakaw	233-4312
29	Rosthern	232-5566
30	Unity	228-4133
31	Nipawin	862-1788
32	Prince Albert	953-2780
33	Shellbrook	747-2151
34	North Battleford	446-7462
35	Lloydminster	825-7632
36	Meadow Lake	236-4441
37	Strasbourg	725-3777
38	Turtleford	845-2131
39	Fort Qu'Appelle	332-5681
40	Rosetown	882-3227
41	Carnduff	482-3432
42	Kelvington	327-4718
43	Watrous	946-3395
44	La Ronge	425-4400
Rural Service Centre	Gravelbourg	648-2771